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Emerald Lake, in south central Montana, will soon be invaded by eager anglers as the spring warmth frees the water of its winter ice. Cover photo by Michael Sample. On the back cover, Gus Wolfe has captured on film the yellowbell helplessly blanketed by a late snow.

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a livable environment for WILDLIFE is a quality environment for MAN

REALTORS, WILDLIFE AND MONTANA'S FUTURE

The Jan./Feb. 1974 issue of *Montana Outdoors* contained an article ("The Subdividers are Here") critical of increasing subdivision development in Montana. As most people probably know by now, the feature created a stir, primarily among those engaged in subdivision activities.

Since then, the Montana Assn. of Realtors issued several news releases critical of our department, the Montana Fish and Game Commission and our attitude toward subdivision development in general. Recently, the Association's newsletter suggested some "ideas to begin solving the problem," and that "the commission's time and effort could have been spent on a positive approach rather than producing a negative magazine article." The newsletter said the organization believed wildlife values of land should receive equal consideration with other values, a statement with which we strongly concur. But the newsletter also asked the department to provide specific documentation of "critical big game winter range" and other information.

We want to remind the Association that the Dept. of Fish and Game is a public agency. As such, our files are open to anyone. However, in checking at press time with our regional offices where most of this information is located, few of our people can recall any such requests for information. In other words, the Association's newsletter requests information on wildlife and recreation as a "positive approach." But few, if any, realtors have ever been "positively" concerned enough about loss of wildlife habitat in the past to actually request this information. And in the meantime, important and irreplaceable winter range areas and other wildlife habitat in Montana has lost its value to wildlife.

Prior to January of this year, our department invested both time and effort inspecting and commenting on 93 subdivision impact statements, 37 of which were directly detrimental to wildlife. From 1967-1972, approximately 9,000 acres of prime big game winter range was subdivided in *Flathead County alone.* Multiply this by the situation in other parts of the state, and you can better understand our concern.

Another point that needs to be made in this regard is that impact statements should *precede* the decision to subdivide—projects then should be modified or rejected on the basis of broad environmental and social considerations, wildlife included. Realtors have fought such impact statement procedures in the past.

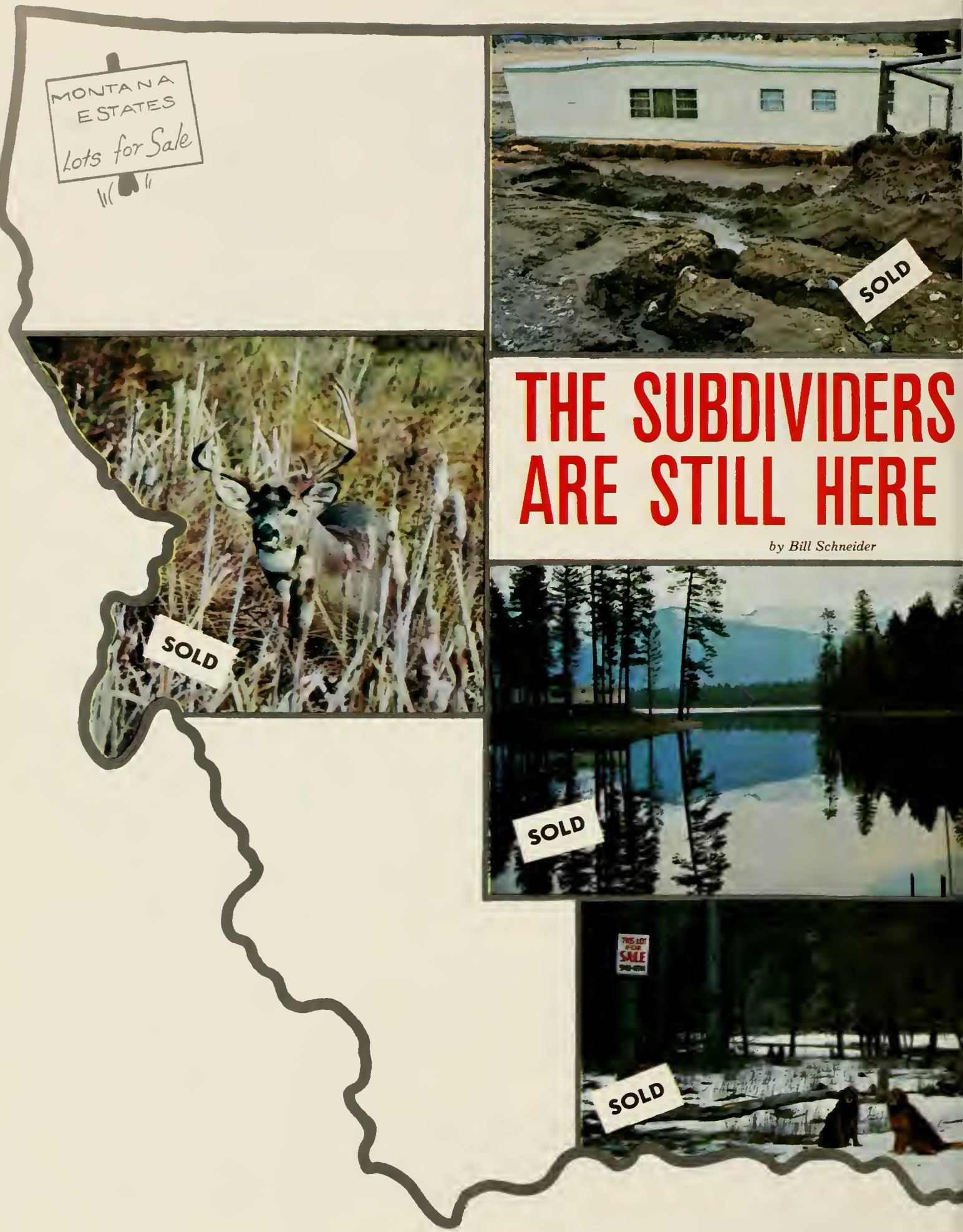
Anyway, the information is available for use by subdividers, and we would like them to use it. That is precisely why we urge Montana to go slow on land development until necessary inventories and plans, as well as protective legislation, are realities. Oddly, the Montana Assn. of Realtors, which now publicly states the need for such information, strongly opposed legislation that would have allowed them time to gather and use it. The Association's newsletter recognizes the desperate need for this basic information—yet the Association fought legislative efforts to give Montana the time it needs to adequately consider and protect Montana's unique environment. Obviously, time is on the developer's side, not on Montana's.

Our concern is based on the fact that wildlife has become an indicator of a quality way of life Montanans wish to protect for future generations. In most cases, regardless of whether the subdivision is well planned and complete with all types of protective covenants, the mere fact that an area is subdivided in the first place means problems for wildlife and other public values. By watching the impact of land development on wildlife, we may have a sneak preview into Montana's future. The sooner others realize this, the sooner we can count on a quality way of life in the future.

In the meantime, our doors are open and all our information available. If you are a subdivider and if you really care about wildlife, stop in before you get too deeply committed. We want desperately to help but we can't unless we know who you are and what you are contemplating.

Wes Woodgerd

Wes Woodgerd, Director
Department of Fish and Game



THE SUBDIVIDERS ARE STILL HERE

by Bill Schneider

IN THE FIRST part of this article (Jan./Feb. 1974), we promised to present detailed information on four individual subdivisions and their effect on wildlife. This turned out to be a demanding assignment—for two reasons.

First, it became increasingly difficult to write "briefly" about certain developments. In all cases, many more words were needed to adequately spell out the impact on wildlife.

And second, how could we choose only *four* rural subdivisions on a statewide basis? Every development we inspected had some bad consequences for wildlife. So the following four developments don't necessarily represent the "four worst" rural subdivisions as far as wildlife is concerned. However, we feel they are "fair examples" of the *type* of land development the department considers a severe threat to wildlife.

Beaver Creek South, just north of Yellowstone Park, promises to affect big game in Gallatin Canyon. This region is already widely known for its wildlife. In severe winters, the upper Gallatin elk herd migrates from Yellowstone Park into Montana, seeking its traditional winter range. After studying this situation for decades, the department concluded the best management actions are: (1) protecting as much of the rapidly disappearing winter range as possible and (2) keeping the herd in balance with the carrying capacity of existing winter forage through management hunts.

Already complicated enough, game management in this area doesn't become easier with rural subdivisions popping up all over the valley.

Such is the case with Beaver Creek South, located directly adjacent to the Gallatin Game Range. This management area was purchased by Montana sportsmen to protect big game winter range and to provide public land for hunting.

This has a direct correlation with Beaver Creek South, as aptly pointed out by LeRoy Ellig, the department's regional coordinator in Bozeman. ". . . People living on the south end of the Gallatin Game Range plus the trustees of the Ophir Grade School complain about hunting on the game range," Ellig wrote to Brelsford & Associates, a Bozeman consulting firm involved in the project. "This reminds me of people who build close to the airport and then complain about the airplane noise."

Ellig also predicted that the people moving into Beaver Creek South ". . . will no doubt attempt to change the long established hunting use of a large part of the general area." As an example, he pointed to "a proposal by Big Sky Corporation to make a large portion of the West Fork of the Gallatin River a game refuge and allow no hunting."

Commenting on this possible upsurge of anti-hunting sentiment, Don Brelsford replied, "The problem seems to me to be primarily an educational and public relations one."

Brelsford also told MO that the site was definitely not chosen because of its proximity to a prime wildlife area. Instead, he said, Beaver Creek South was conceived as an answer to the severe housing shortage created after Big Sky moved into Gallatin Canyon. The proposed development, only six miles from the massive ski resort, will provide housing for Big Sky employes.

The developer, Beaver Creek South, Inc., has suggested some protective covenants, with wildlife in mind. First—and most important—the covenants forbid large, free-roaming dogs. Residents aren't allowed to own dogs larger than 25 pounds, and even those must be confined. The developer also asks that residents keep snowmobiles and other off-road vehicles on the roads.

Covenants are great, except that the local landowners association (e.g., the people living in Beaver Creek South) will have the responsibility of enforcing them. If they don't, there isn't much anybody else can do.

Ski Yellowstone, proposed as an all-season resort, lies in a prime (and fragile) recreation area, near two Forest Service roadless study areas.

The east Hilgard region overlaps to some extent the special use permit applied for by the Ski Yellowstone developer. Although still essentially a roadless area, this region was recently deleted as a wilderness candidate area by the FS.

Again, although the development doesn't rest on a critical wildlife area, it nevertheless promises to severely affect the region's wildlife, mostly because more people will use the area.

The public can still do something about Ski Yellowstone. The proposed ski facilities lie on public land and require a special use permit from the FS. The developer, Hans Geier, applied to Gallatin National Forest officials for this permit in early October, 1973. Lewis E. Hawkes, supervisor of the GNF, told MO the decision won't come until some time this summer.

In his application, Geier wrote that Ski Yellowstone "is envisioned to harmonize with the existing environment and to create as little impact as possible on the alteration of the existing environment.

"It is hoped," he continued, "that many local families will live permanently in the planned village,

continued

Upper right—a mobile home on unstable soil near Bigfork, photo by Bill Cunningham. Upper left—white-tailed deer, one species seriously affected by rural subdivision development, photo by Jon Cates. Middle right—Echo Lake near Kalispell. Is something out of place in this picture? photo by Bill Cunningham. Lower right—people often move to the country so their dogs can roam. This may be good for the dogs, but it can be bad news for wildlife. photo by J. George Hummel

In 1972, the dike "protecting" the area now at least partially occupied by the Greenwood Addition ruptured. One must also remember that the high water of 1972 was considerably below the anticipated 50-year flood level.

In the same year, 1972, the U.S. Corps of Engineers was forced to build emergency dikes around the settling ponds of a sewage treatment plant now serving the Greenwood Addition to keep sewage from the Bitterroot River.

and then many non-resident families will establish 'second' homes. Year-'round recreational facilities will attract visitors from all over the world into the West Yellowstone area."

Because of this, Geier described the venture as a "thoughtfully proposed undertaking."

Meanwhile, Hawkes and his staff will study whether the ski facility is in the public interest. In making a decision, they can use public input. Send your letters to Lewis E. Hawkes, supervisor; Gallatin National Forest; Bozeman, Mont. 59715.

We have a news release from the FS regional headquarters in California which, in part, reads, "Until studies are completed, we will not issue any permits for use of National Forest land that would be used in conjunction with the development of adjacent private lands." This release is dated Nov. 12, 1970. Perhaps this California press release suggests a sensible course of action for Montana. Undoubtedly, the Treasure State will experience the same growth pressure California did. And perhaps we're now in exactly the same situation, only a few years behind our heavily developed neighbor to the southwest. In short, Montanans probably should take California's bad experiences to heart and move to prevent or slow down this kind of growth—before it's too late.

Greenwood Addition, south of Missoula along the Bitterroot River, offers a prime example of floodplain development which resulted in artificial manipulation of a natural waterway.

In 1972, some high water (less than the magnitude predicted for the 50-year flood) broke through a dike constructed to protect the area and inundated the floodplain. As a remedy, the developer brought in bulldozers to gouge the streambed up onto the dike, making it a few feet higher (see photo). The result was loss of stream productivity along the length of the dike (about 4,000 feet), as well as some distance downstream.

Such diking only moves a problem to another area. As a result of this diking, landowners on the opposite side of the river have initiated court action to have the dike removed. So what was gained? Floodplain acres on one side of the river may still be inundated by raging flood waters, and the opposite bank is eroding extensively.

This damage to the Bitterroot River came as a direct result of the desire to take a few more acres of land from the river for homesites.

Fortunately, Greenwood Addition has the services of a sewage treatment plant. Unfortunately, the plant also lies within the floodplain. In 1972, the U.S. Corps of Engineers was forced to construct emergency dikes (see photo) around the plant's settling ponds to keep the contents out of the Bitterroot.

What will happen to Greenwood Addition and the sewage treatment plant when a real flood comes, not merely some high water as experienced in 1972?

We visited Greenwood Addition and found the terrain was "flood swept" with piles of water-deposited debris looming within a few feet of some mobile homes.

As far as wildlife is concerned, the Bitterroot Valley has been heavily subdivided because of its once beautiful scenery and closeness to Missoula. This resulted in a severe reduction of white-tailed deer, waterfowl and game bird habitat as well as stream channel destruction and resulting loss of fish habitat.

No Name Park is a hodgepodge of mobile homes bordering the Yellowstone River about three miles south of Billings. "No Name Park" is *not* the subdivision's name. It doesn't have one, so we coined this name.

No Name Park lines the Yellowstone in a sprawling and disorderly manner for several hundred yards. Each of about 50 trailers is on a septic tank

continued

Bulldozers reinforcing the dike around Greenwood Addition—one example of a natural waterway artificially manipulated as a direct result of rural subdivision activity.

"No Name Park," just south of Billings on the Yellowstone River, became a reality with little regulation or public input. F&G photo by Bill Schneider

and drain field. And, as the picture on page 5 illustrates, the water table lies only a few feet below the surface. The point being sewage from this development may seep into the Yellowstone River.

Such seepage gradually increases the nutrient content of the water. This, in turn, makes the water better suited for algae and other vegetation—and less suited for fish. (See "Aquatic Invertebrates," page 31.) This occurrence, eutrophication, is a natural process; for example, through the years, a pond becomes a meadow. So, man-induced nutrients (e.g., sewage) *speed it up*. The stream or lake "ages" more rapidly.

Because it started six or seven years ago, this subdivision began with little regulation. In fact, while investigating this project, it was discovered that the developer, Gerhart Blain, held *no permit* for his development. Neither the State Dept. of Health and Environmental Sciences nor the county sanitarian had approved it. As we go to press, authorities are ruling on this possible violation.

We contacted Blain for his feelings about the development. He promptly told us he thought we had no business concerning ourselves with what he does on land "I've fought with my heart and blood to get." He also believes his development isn't adversely affecting the Yellowstone River.

We asked him about the possibility of sewage seeping through the strata into the Yellowstone. He emphatically replied that it just doesn't happen because "my nearest one [trailer] is at least one-quarter mile from the river."

Contradicting Blain, a member of the Yellowstone City-County Planning Board who showed No Name Park to us called it "absolutely the worst kind of development." For example, the planner notes, it lies in the "direct outwash" of the Billings landfill. "When a big rain comes, the dump overflows and washes right across this land."

The official also said that the Yellowstone had been diked, forcing it to flow north, away from the development.

Yellowstone River lowlands—such as those occupied by No Name Park—provide excellent habitat for white-tailed deer, waterfowl and many species of small game and nongame wildlife. Conceding that such development severely impairs the site's worth to wildlife, Blain again insisted it was his land and thus it was well within his right to enhance or destroy wildlife habitat.

As with Greenwood Addition, No Name Park obviously lies on the floodplain. Someday the Yellowstone will flood again. (This area has been flooded many times in the past.) The waters may claim the trailers wrongly put on the river's floodplain. This personal property loss may, in turn, be paid by publicly funded insurance programs. Lives may be lost. And all because of the lack of authority and commitment to discourage such development.

Thus, with this and many other rural subdivisions, the subdivider's short-term gain becomes Montana's long-term loss.

THE ONLY "GOOD" PLANNER IS A QUIET PLANNER

On Feb. 27, 1974, about 30 concerned citizens crowded into the regular meeting of the Flathead County Areawide Planning Assn. The Board gathered to discuss the dismissal of Paul Kane, one of its planning staff. Kane had raised the hackles of the Flathead Board of County Commissioners. And now they planned to release him from the APO staff.

It all started a few days earlier (Feb. 11) and then snowballed. Kane wrote a widely publicized letter suggesting possible unethical—and maybe even illegal—subdivision approval procedures. The commissioners, the APO and Kane's supervisor, Stephen Petrini, were obviously disturbed when Kane released it statewide. (Copies of the letter went to the attorney general, the Dept. of Intergovernmental Relations, the Environmental Quality Council and the media.) In fact, Joe A. DeLong, chairman of the board of county commissioners, was quite angered when Kane sent copies "all over the state." DeLong demanded a public apology.

Kane made three accusations in his letter. First, he questioned the widespread practice of filing subdivisions with a Certificate of Survey (CS), which according to Kane "effectively circumvents the review process." In simple terms, if the plots are larger than 10 acres, they can be filed by a CS and avoid regulation required in the present subdivision law, SB 208.

Second, Kane objected to the "informal way" plats filed before the effective date of the new subdivision law were handled.

Third—and most serious—Kane charged that some subdivisions had been approved in "complete disregard" of the laws and regulations. As an example, Kane pointed to the Tedmar subdivision "which occurred 31 July 1973 [*after* the effective date of SB 208—Ed.] and bears the signature of Joe A. DeLong as Chairman of the Board of County Commissioners." Kane and Deputy County Atty. Dean Jellison, totally disagreed on the Tedmar development. Kane insisted it was not handled properly, and Jellison stated everything was in order.

After some additional study, Kane said he was satisfied on the first two points. But he stood his ground on the Tedmar subdivision. "It is my personal opinion," he wrote in a later letter, "that Tedmar subdivision was not properly handled and should not have been filed without exposure to the County Planning Board at a public hearing."

All this prompted a special APO board meeting on Feb. 22, 1974. Here the conflict was thoroughly discussed, but action postponed until the next week's regular meeting. The commissioners instructed Jellison to prepare a brief on how Tedmar was handled.

Then came the regular Feb. 27 meeting. The commissioners (two of them sit on the board) attempted to close the meeting to the public, but Kane cited clauses from Montana's new constitution preventing the closure.

The commissioners presented a letter to the board in which they said Kane was "not compatible with the other members of the planning staff" and thus should be removed.

Some discussion occurred before the vote. Several people spoke in Kane's behalf and one member of the planning staff stood up and said Kane was definitely compatible and they enjoyed a good working relationship.

The vote was 5-4, ending Kane's employment with APO. (Three members of the board were absent.)

On March 1, Kane received an unsigned letter from Petrini informing him that his employment was terminated effective March 15.

We visited with Kane after his dismissal. He obviously knew what the reaction to his letter would be. But the planner has a sincere feeling for the land. He didn't like how things were going. He knew nobody would publicly announce the problems if he didn't take the initiative. And he knew the public should know. Right or wrong, the public has a legal right to know the activities of public agencies such as the APO and the board of county commissioners. It is an unquestionable constitutional right.

Even now, the question of Tedmar's handling remains completely unanswered, as it probably always will. On June 20, 1973, Petrini, at Kane's suggestion, asked the commissioners why there were "no apparent written records" of its approval. DeLong replied, "We cannot find exactly when Mr. Groenke [the developer] came in to see us, or positively if he did, but as you know these things do happen."

QUESTIONS AND ANSWERS

After publication of the first article on subdivisions (Jan./Feb. 1974), we've answered a few questions over and over. So we thought it best to answer them here—for everyone.

Q. *In areas such as the Flathead Valley and other western and south central counties where one-half or more of the land lies in public ownership, why do subdivisions affect wildlife adversely?*

A. Some of the best and most critical wildlife habitat—and especially big game winter range—lies in foothills on the edge of high, forested regions or in fertile stream bottoms. This land is usually privately owned.

In Flathead County alone, 9,000 acres of big game winter range has been subdivided in the last five years. That's nearly one-fourth of all the land subdivided in Flathead County during that period. These figures, gathered by the Flathead County Areawide Planning Organization, vividly illustrate how important private land is to big game, even though it composes a small part of Flathead County. And as we've noted many times in MO, winter range is critical in managing big game.

These areas—stream bottoms and foothills—also receive heavy use by game birds, waterfowl and nongame wildlife.

Unfortunately, these areas are also the most common locations for subdivisions. The buyer either wants to live by a stream or next to public land—thus, the real crunch on winter range and other wildlife habitat.

Q. *There must be some good subdivisions. Where are they?*

A. Every major Montana city has some. They're within—or near—the city limits, close enough to hook up to city facilities. Impact on schools and the community is carefully considered. And they don't severely affect wildlife because of their close proximity to the city. In most cases, this land already has minimal value to wildlife.

Q. *Will land use decisions "take" the land from private ownership and abolish the principle of private property rights?*

A. Private property owners will always have many future economic options for their land. However, some options may not always be the *most profitable*. All landowners eventually must accept this.

The land will never be "taken." Even under strict zoning, the property remains in the owner's possession.

Many landowners consider owning property a responsibility, or as some ranchers and farmers put it, a "stewardship." However, the public has some interest in what happens on private land. And one must also consider the possible "taking" of *public* rights such as clean air, wildlife and scenery in the name of private profiteering.

Q. *Where will people live if Montana doesn't allow rural subdivisions for a few years?*

A. We tried to find out how many vacant lots existed in already platted and approved subdivisions—and failed. But it's safely said that the figure is high. A drive through any rural subdivision (most of them, at any rate) reveals dozens of lots either unsold or uninhabited.

This, added to the many people moving into the city because of energy shortages, provides all the land Montana needs for people wanting to live in the country. Perhaps they *shouldn't* move to the country, but if they insist, there will be room.

And, beside this, there's always the living space within city limits. Nobody will go homeless if rural subdivisions aren't allowed for a short time.

Q. *Where should authority for controlling subdivision development lie?*

A. In the previous article, we suggested investigating the possibility of taking the authority away

continued

from the counties. However, after some "investigating," we think it *can work* at the county level. Unfortunately, *it isn't working now* in many counties. The earlier discussion of the dismissal of Paul Kane, a Flathead County planner, testifies to this.

Perhaps the best answer is at the local level—the board of county commissioners. However, there must be some system of checks and balances, so when a county isn't doing the job, either a regional or state agency steps in and takes over. Right now, no such system exists. If a county shrugs off its responsibilities—which *is happening* in many places right now—almost nothing can be done about it.

Q. *Isn't the Dept. of Fish and Game too concerned about wildlife? What about people?*

A. Like most environmental problems, it's easy to miss the basic connection between wildlife and people. A good environment for wildlife is also a good environment for man. So when unwise land development begins to destroy wildlife habitat, man's surroundings automatically become a little less livable.

It is most certainly the department's obligation to speak out on serious environmental problems affecting the future of wildlife. By remaining silent, we would (1) fail to represent the feelings of Montana sportsmen and (2) ignore our obligation to Montana's fish and wildlife resource.

The department doesn't seek veto power over developments. However, we do wish to keep Montanans informed of the effects of land development on wildlife.

CAN THE PUBLIC STOP A SUBDIVISION?

In most cases, no. But after some searching, we feel that question can't be answered definitely. However, developments *can* be prevented by a concerned citizenry. And here are two examples:

Wilderness Gateway was a Californian's dream—developed by Californians for Californians. It was also a Montanan's nightmare. Located north of Ovando in western Montana's Blackfoot Valley, it promised nearly everything people normally associate with "the good life in the country." It bordered the vast Bob Marshall Wilderness, had excellent trout fishing and big game hunting nearby, clean air and water and beautiful scenery for every window.

Area residents awoke to reality when they learned of the impending subdivision. They awoke disturbed, worried about their valley. They banded together, armed themselves with petitions and hurried off to the Powell County Commission to protest. The commissioners, while concerned about the complaints, thought they were bound to approve the project because they had more or less given their word. Residents pressed them for specific reasons to justify their upcoming action, but the commissioners couldn't come up with any.

The commissioners stood fast in future meetings, even after it was discovered the subdivision was right smack in the center of a prime elk calving area. The protesters regrouped and started chipping in—a dollar here, five dollars there—and hired a lawyer, James Masar of Deer Lodge. (Don White, a Bozeman attorney, also helped with the resulting legal action.) And then they went to the commissioners again, but again to no avail.

About this time, a public meeting was held in Ovando. The old town hall probably will never be the same. One official called it the "most exciting" public meeting he ever attended. And he goes to many such gatherings. About 100 valley residents (mostly farmers and ranchers), representatives from several state and federal agencies, the media and the developer, Dick Underwood, attended.

Joe McDowell, who was instrumental in organizing the meeting and the protest, called the meeting to order. The first speaker was R. Byron Roberts from the Dept. of Intergovernmental Relations.

Roberts told the people their valley had finally started to grow. "You can't avoid it," he warned. "It's sure to come."

Evan Denney, assistant professor of geography at the University of Montana, Missoula, was next. Widely known as an authority on land use planning and site capability, he called the proposed site "mostly unsuitable for development." Denney concluded, after studying the site, that "with one small exception" it should be used only for "recreation and management"—or, in short, for wildlife, grazing, timbering or similar purposes.

MINI-EDITORIAL

In this article, we address many individual problems of individual subdivisions. However, it's vitally important to recognize the overall consequences of *this type* of land development.

Sometimes the developer can rearrange the plat, add covenants, reduce density and suggest other improvements to make the development "better" or "more compatible." Montanans should be glad that many subdividers willingly accept public suggestions to lessen impact on the community, schools and wildlife. But the question of whether the development should take place *at all* seldom comes up.

In our opinion, local residents—while reviewing a proposed development—should sometimes approach it on an "if" rather than a "how" basis.

MESSAGES

TO ALL DEVELOPERS:	Remember the day when the commissions, councils, planners and local residents automatically accepted your assurances that the new project would benefit the community?
TO ALL SUBDIVIDERS:	Someone is watching you.
TO ALL LAND BUYERS:	Are you contributing to the destruction of the land you plan to buy?
TO ALL LAND SELLERS:	Make sure you know what the person who buys your land plans to do with it.
TO ALL MONTANANS:	Do we need a Montana Undevelopment Commission? Where are we growing? Should we care?

Next, Bill Cunningham of the Dept. of Natural Resources and Conservation stood up and warned of haphazard, unplanned growth. He told the ranchers they weren't prepared for it and suggested a temporary moratorium as the best possible option.

That was about all Underwood, the developer, could take. He stomped to the podium, obviously angered. First, he threatened to sue Denney for trespass since the professor hadn't asked for authorization to conduct the study.

Underwood went on to dispel "rumors" that there would be "a bunch of hippies running around" and brothels if the subdivision was approved. He also assured the audience of his belief in the "color barrier" and that he didn't take dope. "I have two sons with short hair and they both work hard," he said.

Sitting there stone faced and unbelieving, valley residents listened to Underwood acclaim himself as a clean living and understanding developer. "I want to be accepted," he said. "I want to be part of the community. I'm going to build one of my second homes right here on this property. I've developed all over the West, so I know what I'm doing. Why I'm just like you folks. I raise avocados down in California."

After that, two resolutions were suggested: (1) form a Powell County Planning Board and (2) support a moratorium on subdivision in the upper Blackfoot drainage. Both passed, the only dissenting votes coming from Underwood and two of his employes.

Now, the landowners were solidly united *against* the project. They—through their attorney, Masar—took the resolutions to the commissioners and were denied once more. So they asked Masar to bring legal action, which he did.

On May 8, 1973, Judge Robert Boyd granted the landowners a temporary restraining order to hold up the development. Ironically, Underwood flew up the very next day, expecting to make a quick stop at the county courthouse for his approval papers and then move in the bulldozers. Greatly disturbed at finding his project stalled, he hired legal help and pressed the point. On May 24, 1973, following a court hearing, Judge Boyd made the order permanent and instructed the county to pay all expenses the landowners accrued during the protest.

Disgusted, Underwood sold the land and went back to California. Wilderness Gateway was stopped—definitely a proper conclusion to a long struggle. Commenting on the outcome, Masar told MO, "This is an excellent example of what people can do when they get steamed up and organized."

Deer Meadows, unlike Wilderness Gateway, has not (at press time) been stopped. However, any observer, including the developer, would admit some serious problems exist and that the future is far from bright.

This high density, 108-acre mobile home subdivision was planned for a foothill area five miles northwest of Kalispell. Already recommended for approval by the Flathead City-County Planning Board, it is ready for the Flathead Board of County Commissioner's approval, disapproval or conditional approval.

continued

But now, as with Wilderness Gateway, local residents have "discovered" it. They—about 150 property owners—have formed the West Valley Landowners Assn. and plan to oppose the development.

In October, MO first became interested in the proposed development and contacted George Ostrom, one of six Flathead businessmen with interests in Deer Meadows. Our query was spurred by a comment from our Kalispell office. "The potential of ground water pollution and the loss of critical deer winter range point out the severe problems this subdivision would have on the environment," wrote Otis Robbins, region one information officer, in October 1973. "Based on these and other adverse impacts on the school system, we would recommend that the subdivision be disapproved."

Asked about this, Ostrom responded, "I saw a deer there once . . . that's why I named it Deer Meadows. Having lived here for 40 odd years, it has been my observation that deer just pass through this area. I was told not to subdivide agricultural land, so I picked the lousiest land I could find. It took me months to find the right piece of land."

Ostrom also claimed the Areawide Planning Organization said Deer Meadows was one of the "most thought out" subdivisions they had ever seen. APO officials, however, failed to confirm that statement—nobody could "remember" saying anything like that. The APO, however, admitted it didn't think the subdivision was "too bad" until the school and wildlife problems cropped up.

Would he develop anyway—even though it was vital whitetail winter range? "I believe I would have to," he replied. "I think my information is as good as anyone's. And when they speak of critical wildlife areas, I think there's more emotion than science involved.

"I'd like to see the statistics," he said, "because they [the Dept. of Fish and Game] might have to prove it in court." If Deer Meadows is disapproved by the county commission, Ostrom said he "wouldn't have any choice" but to take it to court.

SPRINGBOARD

"The real estate sucker has proved his point, multiplying at an astonishing rate. There are no slopes too steep, no soils so unstable, no ecosystem so fragile that those modern-day hucksters won't try to sell to some innocent sap. The danger is that while those interested in wildlife debate hunting, the "developers" continue merrily on their path of sending wild lands and wildlife into oblivion."—*Nathaniel P. Reed, Assistant Secretary of the Interior*

FOR DISCUSSION

There has been some conflicting information on whether Deer Meadows subdivision lies on whitetail winter range. However, department winter range information clearly indicates that it does.

About this time, the West Valley School Board brought in its objection. It seems the development would seriously overload existing school facilities. "We're bonded to capacity," noted Ken Krueger, board chairman. "There's no way we can handle it."

In a preliminary appraisal of the situation, the county commission asked the developers to work out something with the school board and implied they were through with Deer Meadows until this was done. To date, this conflict remains unresolved.

How will Deer Meadows affect the tiny West Valley School? Krueger says, "This [subdivision] could add 200 [students] to the school. And we have 130 now.

"There's no way it can work," is the official conclusion of the school board chairman.

This uproar about overloaded schools and lost game range prompted a public meeting on Jan. 7, 1974. Here, the developer received a verbal lashing by those who just didn't want any more people around, parents concerned about the school problems and taxes, and sportsmen wondering about the future of deer hunting.

(When challenged about the loss of whitetail winter range, Ostrom remarked, "Whitetail deer are not germane to this situation.")

The West Valley Landowners Assn. asked—on Jan. 31, 1974—for a complete moratorium on subdivision development in this area. But the county commissioners haven't made a decision.

Meanwhile, Ostrom proclaims that while everyone tries to make up his mind, "I'm left holding a $112,000 white elephant." And now he wants to sell the land and make the elephant go away. "If the [Dept. of] Fish and Game thinks this is valuable winter range, well then, I think they ought to buy it from me," he frankly points out.

Like Wilderness Gateway, Deer Meadows has two chances for a happy ending. First, the county commissioners may disapprove it. And second, the department may buy it. If we secure the 108 acres, local landowners have agreed not to develop thousands of acres of bordering land. This, in short, could become a large and protected winter range—good news for white-tailed deer.

Wilderness Gateway and Deer Meadows are only two cases. But after studying them, it's clear that citizens totally dedicated to stopping a certain development have a chance. It's always a long, uphill trek, but it can be done.

It reminds us of an often used quote by Edmund Burke, "All that is necessary for the forces of evil to win the world is for enough good men to do nothing."

(We'll report in a later issue on the outcome of the Deer Meadows situation.—*Ed.*)

SUBDIVISIONS ARE FOREVER

In the past three years, Montana's population grew more than it did over the past ten years. The Dept. of Intergovernmental Relations estimates a population of 781,000 by 1980. That's up 86,000 from 1970. From 1960 to 1970, Montana increased by only 20,000 persons. So using these figures, it looks like Montana's growth rate may jump by 430 per cent this decade.

People won't stop coming or disappear like mist in the morning sun. "No growth" is definitely a pipe dream. Even with zero population growth, which the U.S. has achieved, the nation's population won't level off for 75 years because the people who will bear children are already born.

Thus, Montana faces its most critical environmental crisis—land development. Why the "most critical"? Unlike strip mining, destructive logging, overgrazing, stream channelization and many other resource activities, land development—the physical act of putting permanent structures on the land—is a *total* use of the land.

It's this "totality" that scares us. With uncompromised effort, land might recover from strip mining or clearcutting. Given the same opportunity and much time, a stream probably can cleanse itself of pollutants or re-create its meanders following manipulation of the channel. But *subdivisions are forever.*

People will resist, though. We're confident of that. The cry for slow growth comes from many directions—the businessman who finds a cabin by his favorite fishing hole, from the salesman who stops four times for a stop light (in Montana?) and from the native who can't see his favorite scene because of air pollution. All of a sudden the problem is *here*, not far away in California.

Call it a resistance to change. "Leave it the way it is." "Stay away." To some degree, people probably always thought this way. But now it has grown to a revolution that's sure to sweep Montana.

This revolution—the land ethic—came to many other states, also. It came to the rest of the nation, too. But in many cases, it arrived too late. Montana *can be* an exception, if Montanans want this. We can do something other states have failed to accomplish—control the growth monster.

Amid all this, wildlife seems pretty meaningless. To the contrary, however, it can be a goal around which to rally. Wildlife is a product of the land, just as man is. Consider a few words from an environmental journalist and champion of wise land use, David Sumner. Read them twice, for between the lines lies the future of Montana.

". . . Last ditch defenses . . . must be invoked if, in the next half century, the big game of the Rockies is to be kept from a largely remnant status. All deal with habitat, and for some reason, its importance has been traditionally hard to get across; perhaps it is because habitat is only land, and land only dirt, and dirt not very exciting, for it only gives life."

POSEWITZ TO RECEIVE CONSERVATION AWARD

James Posewitz, administrator of the department's environment and information division, has been selected to receive an American Motors Conservation Award. Ten awards are given nationwide to professionals in the conservation field.

Posewitz received B.S. and M.S. degrees in fish and wildlife management from Montana State University, Bozeman. He joined the department in 1961 as a fisheries biologist and became fisheries manager at the regional office in Glasgow in 1962.

He was named head of a newly formed division of environmental resources in 1969 and has headed the environment and information since its inception in April 1972.

Posewitz will receive a citation plaque and $500 honorarium at ceremonies in Washington, D.C. May 15, 1974.

editorial

The following two items were presented at a Feb. 12 legislative hearing on House Bill 875, a temporary moratorium on rural subdivisions. We thought they were well worth repeating.—*Ed.*

what history teaches us

By Dr. K. Ross Toole, Hammond Prof. of Western History, University of Montana, and author of several books on Montana

It was the philosopher George Santayana who said "a people who ignore their history are condemned to repeat it." We have done a great deal of repeating in Montana—so much that we now have very little room left for error—and very little time.

Our repetitive errors have been strangely similar. The heart of the pattern is that over and over again we have asked the land on which we live to do more than it can do. We have impacted it; we have not studied it. The cost of our errors both in human suffering and money has been appalling.

In one of our great early booms in the 1870s and 1880s we put nearly a million head of cattle on the vast open ranges of eastern and central Montana. By the early 1880s we were being warned again and again that we were headed for catastrophe. But nobody listened. We grazed the grass down to its roots—and in the winter of 1886-1887 the catastrophe struck. By the spring of 1887 nearly 75 per cent of all the cattle on the range were dead and so, in effect, was the whole open range cattle industry. How much money we lost we have still not calculated. It was enormous.

Yet when that tragedy should still have been very fresh in our minds, and in that self-same area (eastern and central Montana) we did it again.

This time we impacted the area with *people.* This was the so-called dry land farming boom. We wanted *people* in our sparsely settled land—so we set about to attract them. We advertised; we pressed the Congress into passing the Enlarged Homestead Act of 1901 which granted 320 acres of free land to prospective homesteaders. The State Planning Office and the railroads and Chamber of Commerce and, yes, "land developers" all joined in the campaign. The speculators were everywhere. And the people came. From 1909 to about 1920, 80,000 of them came.

The National Conservation Commission plead for a moratorium so that the land could be studied and classified. They plead with the Congress for a moratorium so that, as they put it, we would "*ultimately fix with certainty, according to the productive value of the surface, a reasonable homemaking area for each class . . . of land, and then solve the problem without mistake or friction.*"

But there was no moratorium and people came. Between 1900 and 1920 the actual number of farms in the area increased from 7,000 to 46,000. Millions of fragile acres were plowed up. Twenty-three new counties were formed—all based on a new population and the larger tax base.

And then came a drastic drop in the price of wheat and also the inevitable and cyclical drought, and 60,000 of the 80,000 homesteaders went broke and the great exodus began.

Two hundred and fourteen banks failed, more banks than we have in all of Montana today. Eleven thousand farms vanished; farm mortgage indebtedness reached $175 million. The average value of farmland in the entire state was cut in half.

Between 1914 and 1922 the cost of county administration rose 149 per cent. The cost of schools increased 172 per cent. Taxes per acre rose 140 per cent. Overall, *county* land ownership increased 5,000 per cent and the cash figure-farmland valuation dropped $320 million. And these were in the days when a dollar really was worth a dollar.

Why did this happen? Because we sought to *develop* an area creating new towns, new roads, new schools, new *everything*—we sought to *develop* that area in a way not compatible with the land, the water and the climate.

We could not wait; we did not study the land; we developed without planning. The money loss

was awesome; the human suffering very great. And it was all done in the name of development.

Then, as today, planning was a dirty word. Then, as today, development and developers meant progress and profit. But it was not true then and it is not true now.

I have alluded to only two instances of tragedy of development without planning and without study. But the history of this state is replete with *dozens and dozens* of other examples. The valleys in the west have all had their booms and their busts. This whole state has been repeatedly traumatized in the past under the rosy rubric of "development."

And, apparently, we're going to do it again. Even the words we are using are the same. The brochures are almost identical. But the basic capacity of our land to sustain impaction and abuse has not changed one iota.

If Santayana was right and "a people who ignore their history are condemned to repeat it"—so is Hegel's view of things all too accurate. He wrote: "The only thing that history teaches is that history teaches nothing."

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ill fares the land

By Elizabeth Smith, representing the Montana Wilderness Association, Montana chapter of Trout Unlimited, Montana Wildlife Federation, Environmental Information Center and Missoula and Helena groups of the Sierra Club

"Ill fares the land, to hastening ills a prey . . ." wrote an 18th century poet, and his words describe Montana today. For our state is gravely ill, the victim of a fast-spreading disease that is blighting our mountains, obliterating our meadows, scarring our valleys and defiling our streams.

We might diagnose the disease of rural subdivision as galloping consumption; it is certainly that in its speed and its capacity to devour. Or we could call it acne, for its erupting sores on Montana's clear and glowing face. Or we can accept the truth that it is cancer—growth that is the vehicle of death. Death for so much of our physical system, so much of our productive soil, uncontaminated water, dust- and fume-free air. Death for so much of our priceless resource of space—the pastoral vision, the promise of wild mountains, the hush and the reach of the land. What will we have of any value when these are gone?

Ill fares the land, and ill fare its people. We too show symptoms of disease. We collapse, trembling, while a band of exploiters plunders our heritage. We stand helpless amid a chaos of governmental responsibilities and regulations, amid a chorus of cynical assurances about "environmental concern" and "careful planning," while subdividers pounce on the weaknesses of existing laws and on the innocence of buyers; while subdividers violate state health requirements, confident that their violations will go unpunished; while subdividers, when operating illegally, are looked upon as respectable community leaders rather than the common lawbreakers which in fact they are.

We wring our hands while a city council, whose floodplain zoning ordinance conflicts with a subdivider's scheme, repeals the ordinance, reversing the decision of the impotent city-county planning board; while the editor of a state agency magazine is attacked by the real estate lobby simply for trying to document the realities of land development in Montana; while, in a world hurtling toward famine and resource depletion and in a nation already beset by food and fuel shortages, fertile farmland is chopped into recreational resorts and second homes—not houses for the homeless but playpens for the affluent. Ah, all of us—Montanans, Californians, all of us—are going to pay a high price, over a long time, for the subdivider's fast buck.

The human disease that engenders the developmental rampage has been described as itching palms and ingrown eyeballs. Indeed we are greed-ridden and shortsighted if we look upon our mountains and meadows and valleys and streams as a commodity for sale or a prostitute for hire, if we won't protect what is the source and sustenance of our lives and the hope for our childrens'. "Beneath all is the land" is a sign in a realtor's window. I think about it each time I walk by. Does he, as he plans to bulldoze another piece of country?

Meanwhile, we are beginning to seek cures for our ills—this and others. The Governor has taken a giant step toward Montana's health and sanity by asking for a moratorium on Yellowstone water permits. Rep. [Herb] Huennekens [D-Billings] tried to take another, equally important, by introducing House Bill 875. Will these positive remedies be accepted by the legislature? Will enough of us, lawmakers and public, be able to turn our eyeballs outward and see the lethal consequences of our present uncontrolled and uncontrollable course—and have the wisdom and the courage to change it?

THE WAY TO THE WILDERNESS

The Wilderness Society will sponsor 106 trips into America's backcountry in 1974. According to Bob Cooney, outing director, excursion possibilities will include backpacking, base camp hiking, hiking with packstock, horseback, water (canoe and raft) and six trips designed especially for youth.

Special care is taken to minimize disturbance of fragile environments and groups will be kept small. "The fun of exploring wild country through this program is enhanced by ample opportunities for nature study, fishing, outdoor photography and relaxation," Cooney said.

Length of trips varies from four to twelve days. Trips usually fill up rapidly, so interested persons are urged to register early. A fact sheet providing additional information about the trips is available from: Trip Department, The Wilderness Society, Western Regional Office, 4260 East Evans Ave.; Denver, Colo. 80222.

Trips scheduled for Montana and nearby states are listed below.

BACKPACKING

ESCALANTE CANYON WILDERNESS—April 14-20; Oct. 6-12. From Cedar City, Utah. Peace & Quiet, Inc., outfitter. $225.

CANYONLANDS WILDERNESS—May 5-11. From Moab, Utah. Peace & Quiet, Inc., outfitter. $225.

CAPITOL REEF NATIONAL PARK WILDERNESS—May 19-25. From Salt Lake City. Peace & Quiet, Inc., outfitter. $215.

FLAT TOPS WILDERNESS—July 2-8; July 3-9. From Glenwood Springs, Colo. University of the Wilderness, outfitter. $215.

HIGH UINTAS WILDERNESS SOUTH—July 7-13. From Vernal, Utah. Peace & Quiet, Inc., outfitter. $215.

EAGLES NEST WILDERNESS—July 11-17; July 12-18. From Vail, Colo. University of the Wilderness, outfitter. $215.

HIGH UINTAS WILDERNESS SOUTH (young people)—July 15-24. From Vernal, Utah. Peace & Quiet, Inc., outfitter. $250.

BEARTOOTH WILDERNESS—July 22-28; Aug. 2-8. From Cody, Wyo. University of the Wilderness, outfitter. $225.

HOLY CROSS WILDERNESS—July 22-29; July 23-30; From Vail, Colo. University of the Wilderness, outfitter. $215.

JEWEL BASIN WILDERNESS—July 23-30. From Kalispell, Mont. Wild Country Outfitters, outfitter. $150.

SAWTOOTH WILDERNESS—July 28-Aug. 3. From Sun Valley, Idaho. Wilderness Encounters, outfitter. $215.

COLLEGIATE RANGE WILDERNESS—July 29-Aug. 2. From Denver. Colorado Outdoor Educators, Inc., outfitter. $165.

WEST ELK WILDERNESS—Aug. 2-8; Aug. 3-9. From Gunnison, Colo. University of the Wilderness, outfitter. $225.

MOUNT ZIRKEL WILDERNESS—Aug. 11-17. From Laramie, Wyo. Jim Richard, outfitter. $140.

HIGH UINTAS WILDERNESS NORTH—Aug. 18-24. From Salt Lake City. Peace & Quiet, Inc., outfitter. $215.

HIKING WITH PACKSTOCK

GRAND GULCH WILDERNESS—April 8-13. From Blanding, Utah. Wonderland Expeditions, outfitter. $180.

LINCOLN-SCAPEGOAT WILDERNESS—June 29-July 6. From Helena, Mont. Wild Country Outfitters, outfitter. $240.

LA GARITA WILDERNESS—July 2-10; Aug. 18-26. From Wagon Wheel Gap, Colo. Bibs Wyley, outfitter. $270.

GROS VENTRE WILDERNESS—July 2-11. From Jackson, Wyo. L.D. Frome, outfitter. $290.

WEMINUCHE WILDERNESS—July 7-14; July 21-28. From Creede, Colo. Charles Kipp, outfitter. $240.

TETON WILDERNESS—July 19-28. From Jackson, Wyo. L.D. Frome, outfitter. $290.

MISSION MOUNTAINS WILDERNESS—July 22-29; Aug. 2-9. From Missoula, Mont. Bud Cheff, outfitter. $240.

SELWAY-BITTERROOT WILDERNESS—Aug. 6-14; Aug. 17-25. From Missoula, Mont. Jack Wemple, outfitter. $270.

UNCOMPAHGRE WILDERNESS—Aug. 9-16; Aug. 21-28. From Montrose, Colo. Farrel Hawk, outfitter. $245.

YELLOWSTONE WILDERNESS—Aug. 21-30. From Jackson, Wyo. L.D. Frome, outfitter. $290.

HORSEBACK

LA GARITA WILDERNESS—July 18-27. From Wagon Wheel Gap, Colo. Bibs Wyley, outfitter. $360.

BANFF NATIONAL PARK WILDERNESS—July 8-14; July 26-Aug. 1; Aug 3-9. From Banff, Alberta, Canada. Bud Brewster, outfitter. $250.

LINCOLN-SCAPEGOAT WILDERNESS—July 12-21; July 26-Aug. 4. From Helena, Mont. Wild Country Outfitters, outfitter. $375.

WEMINUCHE WILDERNESS—July 14-22; July 26-Aug. 3. From Wagon Wheel Gap, Colo. Bibs Wyley, outfitter. $320.

BOB MARSHALL WILDERNESS—July 15-26; July 29-Aug. 9. From Missoula, Mont. Jack Hooker, outfitter. $415.

SELWAY-BITTERROOT WILDERNESS—July 22-Aug. 1. From Missoula, Mont. Jack Wemple, outfitter. $415.

YELLOWSTONE WILDERNESS—Aug. 2-13; Aug. 16-27. From Jackson, Wyo. George Clover, outfitter. $415.

ABSAROKA WILDERNESS—Aug. 3-12; Aug. 16-25. From Billings, Mont. Duane Neal, outfitter. $375.

WIND RIVER WILDERNESS—Aug. 5-14. From Lander, Wyo. Irv Lozier, outfitter. $375.

FLATHEAD-BOB MARSHALL WILDERNESS—Aug. 9-18; Aug. 22-31. From Great Falls, Mont. Chuck Blixrud, outfitter. $375.

SAN JUAN-RIO GRANDE WILDERNESS—Aug. 12-21; Sept. 24-30. From Durango, Colo. Bill Crader, outfitter. $375, $265, respectively.

CANOE

MISSOURI RIVER WILDERNESS—July 15-21. From Fort Benton, Mont. Missouri River Cruises, outfitter. $225.

CANYONLANDS WILDERNESS—Sept. 8-14; Sept. 19-25. From Green River, Utah. University of the Wilderness, outfitter. $275.

RAFT

HELLS CANYON WILDERNESS—June 9-14; Sept. 1-6. From Boise, Idaho. Wilderness Encounters, outfitter. $290.

NORTH PLATTE WILDERNESS—June 10-13. From Laramie, Wyo. Richard's River Trips, outfitter. $150.

CATARACT CANYON WILDERNESS—July 8-13; July 22-27. From Green River, Utah. Wonderland Expeditions, outfitter. $210.

SALMON RIVER WILDERNESS—Aug. 8-13. From Salmon, Idaho. Wilderness Encounters, outfitter. $290.

YOUTH TRIPS

(All youth trips leave from Denver and are outfitted by Vic Wolvin, Colorado Outdoor Educators, Inc.)

YAMPA RIVER WILDERNESS—June 10-14. $165.

SANGRE DE CRISTO WILDERNESS—June 17-21. $150.

MUMMY RANGE WILDERNESS—June 24-July 3; July 8-17. $220.

WHITE RIVER-SAN ISABEL WILDERNESS—July 18-22. $150.

COLLEGIATE RANGE WILDERNESS—July 24-28. $165.

THE CATCHALL

stream access:

WATCH YOUR STEP

If you think you have a right to wade or float down any stream because the public "owns" the land between the high water marks—just as it owns the water—you're wrong.

The public does *not* have legal streambed access in most Montana waterways—under present law, that is. But this interpretation has not, as yet, endured a serious legal test in Montana. So a well funded court case could resolve this question.

Presently, the public has access to all streams declared "navigable." And here lies the problem—what is "navigable"? A quick reference to Webster reveals this definition—"deep enough and wide enough to afford passage of ships." "Ships," according to the same source, are "boat(s)" and especially those "propelled by power or sail."

Does this definition include most large Montana streams? Unfortunately, no. Webster must have been a fisherman, not a lawyer. The determination of navigability is hardly that simple.

In 1966, the department listed 40 streams that fisheries managers believed "could definitely be boated." However, after historical research and contacting various sources, only the following streams passed the navigability test:

- the Missouri River downstream from Three Forks,
- the Yellowstone River downstream from Billings,
- the Kootenai River and
- the Big Horn River from its mouth to the mouth of the Little Big Horn River.

On these rivers, the recreationist has a bona fide right to wade or float within the normal high water marks regardless of the ownership of the land over which the stream flows. And streams on public lands are, of course, also accessible.

But what about the Gallatin, Bitterroot, Beaverhead, Madison, Jefferson, Clark Fork, Big Hole, Smith, Marias and many other Montana rivers? Certainly they can be boated. They are, every year. Why aren't they "navigable"? Legal opinions vary slightly but, in general, only those streams proved to be navigable—for example through documented use by steamboats—*before* Montana became a state now meet the criteria for navigability. A court test could change all this, however.

Right now, conflicts between landowners and recreationists floating or wading a stream crossing private land are infrequent. But with increasing use of streamside lands for recreational subdivisions and similar developments, *it can only get worse.* Already there are examples of a land development company closing a section of a river to the public. A stream traditionally enjoyed by hundreds then becomes an exclusive fishing club for those fortunate enough to own land along the waterway.

On other occasions, a corporation purchases a large parcel of land and closes the river(s) to all except those willing (and able) to pay. In such cases, the angler pays to fish water that belongs to him and for fish that are also owned by the public.

All this spells doom for free public fishing. Indeed, the future looks dismal.

But there's still hope. Imagine an angler putting his rubber raft into a stream at the bridge or other access point—just as he has for many years. He floats for a few miles and then comes to a sturdy fence extending across the stream and heavily adorned with "No Trespassing" signs.

What are his choices? First, and very unlikely, he could paddle his raft back upstream to avoid trespassing on anyone's land.

Secondly, he could beach his boat and walk to the nearest road even though his car might be forlornly waiting at another bridge miles downstream. And, of course, the land he crosses might also be posted.

And thirdly, he might hoist his craft over the fence and continue downstream, knowingly violating trespass laws. (Of course, the department doesn't encourage this, but someday it's going to happen.) The angler is cited for trespass, forcing the conflict into court. The fisherman claims his innocence on the grounds the stream was "navigable"—he was floating it, wasn't he? The court then has two options—to fine him for trespass or declare him innocent because the stream is navigable. In the latter, the stream will, from that point on, be open to free access by wading or floating unless the decision is overturned in an appeal.

If any recreationist decides to challenge streambed ownership, he does have some points on his side, such as:

- An attorney general's opinion by Arnold Olsen states, "It is my opinion that . . .all streams capable of floating logs or which have floated logs to the mill or market are . . . navigable in fact."
- A recent Nevada Supreme

continued

Court decision concurred with Mr. Olsen but went a bit further by extending this to any commercial purpose and/or recreation. (In this case, a company planned to mine mercury in the streambed of the Carson River. The local chapter of Trout Unlimited took it to court and won. The state's highest court declared the Carson River navigable.)

- The stream was obviously navigable because fishermen were floating it.
- There could be historical references to some commercial navigation before Montana entered the Union. However, finding this information requires an extensive literature search.

Former Atty. Gen. Olsen also declared that each stream is a separate and distinct situation. So even if the public won this hypothetical case, it would have to be repeated on every contested stream. However, a clear victory on one stream would influence the next one. Or, in short, one is reluctant to invest heavily in litigation without a good chance for success.

Perhaps the most serious sham to public fishing is that once an angler legally enters a stream, he may not be able to continue either upstream or downstream. Until some bold fisherman tries out the traditional ability of one or a few landowners to keep the public from public waters, we suggest you watch your step. The stream bottom on which you're treading may not belong to you.

CONTEST WINNER DONATES SNOWMOBILE

The department has a new snowmobile valued at about $1,000—because of the generosity of Mrs. Joseph C. Fitch of Bozeman. Mrs. Fitch won the vehicle in a Village Inn Pizza Parlor contest and donated it to the department.

The snowmobile was assigned to the Bozeman office where it will be used for game management activities, including habitat evaluations, population surveys and game range maintenance.

SAVING NORTH DAKOTA

The persistence and dedication of some people amazes us. But that's what it takes. For example, consider a massive Bureau of Reclamation project in North Dakota, called the Garrison Diversion.

This system of irrigation canals and laterals—more than 3,000 *miles* of them—will, according to the BuRec, greatly benefit agriculture on some 250,000 acres. However, a group known as the Committee to Save North Dakota (CSND)—comprised mostly of local landowners—doesn't quite see it that way. "The catch is," reports Dr. Gary Pearson, a spokesman for CSND, "that in order to irrigate this 250,000 acres, *another* 220,000 acres will be required for project features... and an additional 28,000 acres will be required for temporary and permanent easements." Like other BuRec projects, Garrison Diversion is, of course, a tax funded expense to all Americans, not just North Dakotans. (The latest estimate [November 1973] was $433 million.)

The Committee also objects to the "callous and outrageous" treatment many citizens have received and the lower water quality the project promises to bring to North Dakota and Canada. Also pending is a delicate diplomatic confrontation, since Canadian officials question the impact of irrigation return flows on water quality of the Souris and Red Rivers which flow into Canada.

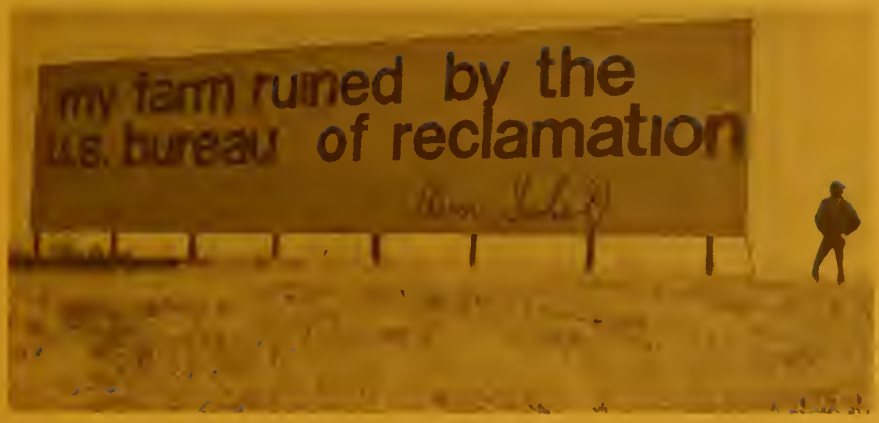
Although not the only reason for public concern, the diversion could eliminate thousands of acres of wildlife habitat, especially wetlands. Instead, however, the BuRec claims $1,027,000 in annual "benefits" for fish and wildlife. (One way the BuRec plans to "develop" wetlands is by flooding to a greater depth the existing wetlands, a questionable practice to say the least.)

Although construction has begun, the BuRec still has some problems, such as:

- Although a final environmental impact statement (EIS) has been filed, the Committee is considering litigation. It seems the EIS never quite becomes "final" because additional "supplements" are continually forthcoming. The CSND feels this "fragmentary" approach to environmental impact evaluation doesn't live up to the spirit of the National Environmental Policy Act.
- The 400-member CSND and almost a dozen other groups are asking for a congressional investigation into the project. "If the project will truly benefit North Dakota," the Committee notes, "it can certainly withstand independent, objective analysis and compliance under the law." However, the BuRec seems reluctant to allow independent evaluation of its project.
- Canada objects to the project, which threatens to slightly loosen now solid international relations.

But the most interesting (and perhaps the most embarrassing to public officials) development came when CSND Chairman Richard Madson challenged a staunch supporter of the project to a public debate on its true value to North Dakota. The supporter, Sen. Milton R. Young (R-ND) replied, "There are many opponents to the Garrison Diversion irrigation project in North Dakota, but you are the only one I consider to be an extremist or even worse. I have more important work here in the Senate of the United States than to spend time debating with you."

Sen. Young's response created quite a stir among North Dakotans. Recently, the 10-man Board of Directors of CSND officially asked the Senator to reconsider. "Every member of the Board of Directors of our organization signing this letter is a



A sign installed by a North Dakota farmer after the Garrison Diversion's McClusky Canal was constructed through his farm. photos courtesy of the Committee to Save North Dakota.

Part of the Garrison Diversion project. Two American avocets look on.

The McClusky Canal. In some places it is 110 feet deep and requires a half-mile right-of-way.

family farmer making his living from the soil. We do not appreciate having those who work for our concerns labeled 'extremist or worse'; we are even more concerned for the fate of the thousands of farmers who lie in the path of the project construction still not started; and we want to see all the facts concerning the issue aired, now, in a public debate.

"As men directly involved in North Dakota's basic industry, agriculture, we ask you to accept Mr. Madson's invitation for a televised debate concerning whether a construction moratorium is necessary on the project at this time."

In the end, will the public be heard? Will the project be thoroughly studied as it should have been *before* construction began. Probably not. To the second invitation to debate Mr. Madson, Sen. Young replied—amid some severe badmouthing of Mr. Madson—that "a debate or any communication could serve no useful purpose."

Such determination—although admittedly of David and Goliath proportions—sometimes is needed to wedge public input into far-reaching, tax funded projects, whether they're in North Dakota, Montana or anywhere else. Let's hope we have a Committee to Save Montana when the Bureau of Reclamation starts pushing for Allen Spur Dam on the Yellowstone River.

Consider the quote by Edmund Burke, 18th century British statesman and orator, under which the Committee to Save North Dakota works: "All that is necessary for the forces of evil to win the world is for enough good men to do nothing."

CORN-FED FISH

Every so often, the department is told fish die from eating corn, and thus it should be outlawed as bait.

After a series of such complaints, the Giant Springs Trout Hatchery in Great Falls decided to find out—one way or the other

continued

—the exact effect of corn on fish. On Feb. 27, 1973, hatchery workers set up two identical troughs and put twelve rainbow trout in each. The trout in trough one were fed *only* canned, whole kernel corn. The trout in trough two continued on the regular pelleted fish food normally used in the hatchery. (The fish were fed and troughs cleaned every morning.)

Trout in trough one accepted the corn readily, apparently finding it desirable and palatable. However, even though the trout consumed all the corn put in the trough, kernels were found at the bottom the following morning. This corn had gone completely through the alimentary canal, but had been only partially digested. Offered this "secondhand" corn at the next feeding, the trout turned up their noses and refused it. At the same feeding, however, *fresh* corn was readily eaten.

On March 9, hatchery personnel dissected a trout from trough one and found corn in the stomach and throughout the entire length of intestine.

On March 28, one month into the experiment, a trout from each trough was examined. Both fish were in excellent condition. It was, however, evident that the straight diet of whole kernel corn failed to provide all nutritional needs of trout. The corn-fed trout were noticeably smaller.

After one month and twenty days, the experiment ended. The fish—all in excellent condition—were returned to hatchery production ponds. Other than the fish sacrificed for examination, no mortalities occurred in either group.

(It should be emphasized that the corn feeding experiment was indeed an extreme situation. The test fish received only corn—nothing else. This, of course, would rarely, if ever, occur in wild fish populations. Even if ice fishing holes are "baited" with cans of corn, it's quite improbable that fish would consume only corn and exclude all other foods.)

What did this experiment prove? It discounted complaints that corn kills trout. Any angler conerned about this would best forget it and turn his powers of criticism to the real threats to Montana's fishing such as stream channel alteration, dewatering and water pollution.

FLASH

Forsyth Mayor Gene Tuma, a former teacher who was western reclamation manager for Peabody Coal, had this to say about the impact of coal development:

"We've got a new feed store just started, a new Ford dealer, a new machinery shop, new trailer courts. It's an expanding situation. The economic impact is really great. We could handle the coal mining just fine, if we could just handle the state. They keep passing laws up there that cost us a lot of money."

*****

The Bureau of Land Management estimates that up to 20 per cent of California's electricity will eventually come from geothermal facilities.

NEW DEPUTY DIRECTOR

Fletcher E. Newby, executive director of the Montana Environmental Quality Council, has been named deputy director of the Dept. of Fish and Game. Newby will replace Keith Freseman who plans to retire June 6—after 25 years with the department, 11 as deputy director.

Newby has headed the EQC since its creation in 1971.

Before that, he was district supervisor for the Dept. of Fish and Game in Billings. He joined the department in 1951 as a fur animal biologist in Kalispell and in 1955 moved to Helena to coordinate a statewide fur animal program. In 1958 he was named big game manager for the state.

He holds a B.S. degree in wildlife technology from the University of Montana, Missoula, and a M.S. in wildlife management from Washington State University, Pullman.

He and his wife, Elaine, have three children, Barbara, Rick and Steve.

ENJOYING WILDFLOWERS

By Cathy Ellis

THE HONK OF northward bound snow geese as they pass overhead, the drumming of ruffed grouse in the nearby woods and the clear song of the returning meadowlarks announce the coming of Montana's all-too-brief summer. The great horned owlets are just opening their eyes, and the Canada goose is brooding her eggs.

Spring also brings another season of wildflowers. The foliage from these plants provides valuable forage and cover for some wild animals; the seeds and fruits furnish food for others.

But, secretly, I have always suspected wildflowers were created for my personal enjoyment.

Montana contains many different plant life zones—foothills, mountain forests, alpine tundra, rolling prairies and river bottoms. Each area has distinctive flora and in each, spring arrives at a different time.

Late May and early June find the eastern foothills covered with gold. Yellow fritillaries and dogtooth violets come first and promise another summer of sunshine. The yellow fritillaries change color with age—from brilliant yellow to dull red. Soon, two other flowers, false lupine (golden pea) and arrowleaf balsamroot, take over the golden hills. False lupine, with its underground stems connecting the plants,

continued

Beargrass, Montana's largest lily, blooms from May through September, depending on the elevation. F&G photo

may grow in large patches. Because it is unpalatable to livestock, these patches may indicate overgrazing. On the other hand, arrowleaf balsamroot receives heavy use by livestock and big game (elk, deer and bighorn sheep).

In June, a drive through the mountains (for example, up the east side of Flathead Lake to Glacier Park) finds roses, larkspur, monkshood and honeysuckle blooming. Twinflowers thrive under the evergreens and iris and orchids flourish in open, wet meadows. When thinking of wildflowers, focus is on the mountains because abundant moisture there nurtures many showy varieties.

The slopes of eastern Montana's majestic buttes host a different type of vegetation. The tops of the buttes sometimes hide ungrazed grasslands or even evergreen trees. The moist slopes and ravines provide habitat for violets, long-plumed avens, clematis, phlox, harebells and ferns. In late summer, golden currants often spring from these ravines.

Late summer wildflowers are dominated by composites (e.g. sunflowers and their relatives). These "worthless," weedy plants brighten a landscape now too dry for other flowers. Gayfeather, pearly everlasting, coneflowers, goldenrod, pussytoes, blanketflowers and daisies are a few common composites. However, an abundance of these plants indicates overgrazing or soil disturbances.

But a drive through the mountains or plains is only one way to "enjoy" wildflowers. Here are a few more suggestions:

WILDFLOWER ARRANGEMENTS

Wildflower bouquets bring nostalgic memories to nearly everyone. The memory may be three dandelions held in the muddy hand of a three-year-old, the smell of wild roses brought by a young husband or a mixed Mother's Day bouquet in a new vase. Expenses of time and gas are quickly forgotten when remembering the fun of a flower-gathering picnic.

Wildflowers provide lasting enjoyment, especially if the following suggestions are utilized.

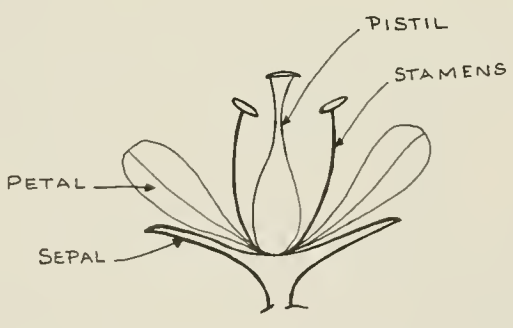
- Remember the land belongs to someone. On private land, ask the owner for permission before entering.
- Take scissors and water containers. Put the flowers directly into the water. If it is inconvenient to take water containers, put the flowers in a plastic bag with a few drops of water, then close the bag.
- Pick flowers just before their prime. With flowers such as lupine, pick when the lower flowers have just begun to open. Early evening or early morning picking avoids the heat of the day.
- Wildflowers need more time to "harden" or soak before arranging than do cultivated varieties. To harden, remove foliage on the stems and let the flowers soak overnight in three to four inches of water. For flowers with milky juices, sear the cut end immediately with a match to keep these juices in the stems. Flowers from bulbs often have a small drop of water at the cut end of the stem. Remove this drop before putting them in water. Slit the stems of woody-stemmed flowers approximately three inches and then crush to help water absorption. Completely immerse violets.
- Be selective in picking flowers, taking only those you will use. Preferably pick 100 feet away from the road so roadside flowers can be enjoyed by others. Leave rare and endangered species (for example, bog-orchids); perhaps the exception is an area planned for development. Before construction equipment moves in, dig up the plants and transfer them to your garden.

After the flowers have hardened, choose a suitable container and arrange them in your favorite way. Perhaps use a basket for daisies or clear glass for violets.

Many Montana wildflowers arrange easily. A few common examples include serviceberry, skunkcabbage, iris, gayfeather, goldenrod or cattails, but try a variety this summer.

DRIED FLOWER ARRANGEMENTS

Have you ever longed for the bright colors of wildflowers on a dreary February day? Dried wildflowers



PARTS OF A FLOWER

ALTERNATE LEAVES

OPPOSITE LEAVES

cheer up those cold winter days. Regardless of the method, the flowers should be fairly dry when picked. Avoid picking flowers with rain or dew on them.

Hanging. This method works best for sturdy flowers such as pussy willows, pearly everlasting, thistle, goldenrod and rose hips. Tie the flowers in small bunches and hang head down in a dry, dark place. Drying in sunlight causes the flowers to lose much color. Depending on humidity, two to four weeks are required to dry the flowers. After this, they can be stored upright until used.

Drying in sand. Larkspur, roses, daisies, lupine and bulbs have delicate flowers which are best dried in fine, clean sand or a mixture of ½ borax and ½ cornmeal or ⅔ borax and ⅓ sand. Flowers dried in sand best retain their color but take one to three weeks to dry; flowers dry faster in the borax mixtures. Prepare flowers by removing all foliage and leaving only a one-inch stem. Place them carefully face down on a thin layer of sand; pour more sand around them until they are completely covered. When the flowers are dry, remove from the sand and clean with a small brush. Add artificial stems and store until ready to arrange.

Pressing. Ferns, autumn leaves and tree foliage can be pressed to provide foliage for dried arrangements. Wildflowers can also be similarly pressed, then mounted on artist's paper and framed to provide original miniatures and still lifes. Arrange the flowers or leaves between two sheets of newspaper, with a layer of corrugated cardboard above and below. Cover the papers with weights and leave overnight. By morning the flowers will be limp, and you can position them in an attractive manner. Then, weight them down again and allow several days to complete drying. Remove the flowers from the newspaper as soon as dry or some of the color will be lost.

Glycerin and water. Another way foliage can be preserved for dried arrangements is in a mixture of ⅓ glycerin and ⅔ water. Crush the cut ends of the foliage and place them in three to five inches of the glycerin-water mixture. Do not remove foliage from the solution until beads of moisture appear on the leaves—a few days to two weeks. The leaves change color and become supple. Then, store them for later use.

Dried flowers, arranged as permanent centerpieces, are more attractive than artificial flowers.

WILDFLOWER PHOTOGRAPHY

A golden field of balsamroot or a single shooting-star can be taken home and enjoyed forever by using a camera. A few simple suggestions improve your pictures.

First, compose the picture carefully. People in a picture often add perspective, but too many clutter a photo and detract from the flowers' beauty. Avoid distracting objects, such as telephone wires. Compose the background as carefully as the foreground.

continued

Look for the coneflower just about anywhere during summer months. Don't confuse it with the sunflower, as they are separate species within the same family. photo by H. Peder Waldum

Indian paintbrush, one of Montana's most common wildflowers, can be found almost anywhere throughout the entire summer. photo by Dave Johnson

Also called "Calypso Orchid," the fairyslipper blooms from late May until late June, depending on the elevation. Although not common, you can find it by searching wet, boggy places and other areas with deep shade. photo by H. Peder Waldum

A small flower often found in vacant lots and ditches with somewhat arid conditions, scarlet falsemallow blooms in early summer. The mallow family includes the cotton plant and the European mallow which provides the "marshmallow" flavoring. photo by H. Peder Waldum

Also called "wild crocus," the pasqueflower is one of the first to bloom in the spring. It's usually found in open meadows. photo by Cathy Ellis

Another view of the pasqueflower or wild crocus. This flower blooms first in low areas and as summer advances, it blooms at higher elevations. In high mountain meadows, it can still be found in late summer. photo by H. Peder Waldum

Because the beautiful leopard lily usually grows with the flower pointed down, it's quite difficult to see. It blooms in June, usually in open forest areas. photo by H. Peder Waldum

Also called "roosterhead," the shootingstar frequents open, moist areas. Look for it as early as April. photo by H. Peder Waldum

Often found in stream bottoms, the serviceberry blooms in late May and June. Later, the flower forms a fleshy—and edible—fruit. photo by H. Peder Waldum

continued

Try framing the flowers with tree branches or other close objects.

Most important, learn about lighting and proper exposure. Many 35mm cameras now have built-in light meters. If your camera doesn't have one, a light meter is relatively inexpensive and helps avoid overexposing and underexposing.

To capture the beauty of a single flower, additional equipment is needed. A camera with good optics is especially important because focusing must be exact. Extension tubes are usually necessary for close-ups of small flowers. A tripod or some other method of steadying the camera also keeps the photograph sharp and clear.

FOOD FROM WILDFLOWERS

Almost everone has tasted the delicious fruits of wildflowers. Raspberry and strawberry jams, elderberry and rose hip jellies are welcome the year around. Fresh berry pies, tart currant or sweeter blueberry and serviceberry bring memories of flowers long past.

But have you ever made your own honey? Alaskan settlers found it difficult to keep bees over the long winter, so some long forgotten settler, hungry for the taste of honey, created the following recipe.

Honey

10 cups sugar (5 lbs.)
1 tsp. powdered alum
2½ cups boiling water
2 cups flower petals

Mix sugar, alum and water together and boil for 10 minutes (medium rolling boil). Then turn off and drop in 2 cups flower petals. Steep 5 minutes. Strain and pour into containers. Combinations of white clover, red clover, rose petals and fireweed blossoms may be used.

Chokecherries, raspberries, strawberries, currants, serviceberries, and rose hips are common in Montana. These berries have a high vitamin C content. When frozen immediately after picking and kept frozen until used, most of the vitamin C is retained. Fruits too seedy for pies and jams can be used for jellies and syrups.

Rose Hip Syrup

Combine 1 quart rose hips and 2 cups water. Boil for 15 minutes. Strain through double thickness of cheesecloth. (Add some pulp to the juice for additional flavor.)

Combine 2 cups of juice with 2 cups sugar. Boil for 1 minute. Use with pancakes and waffles.

Serviceberry Kuchen

1⅓ cups corn flake crumbs
1 cup brown sugar
1 tbsp. cinnamon
1 tsp. salt
⅓ cup soft margarine
½ cup chopped nuts
1 pkg. white cake mix
1¼ cups frozen or fresh serviceberries

Combine sugar, cinnamon, salt and butter. Mix well with pastry blender. Add crumbs and nuts; blend thoroughly. Prepare cake mix according to directions. Sprinkle 1½ cups of the crumb mixture over bottom of greased 13- x 9-inch pan. Spread cake batter evenly over crumbs. Sprinkle serviceberries and remaining crumb mixture into cake

The somewhat rare red cactus is often missed because its beautiful flower appears for only a short time. photo by H. Peder Waldum

batter. Bake at 350° for 35 minutes or until done. Cut in squares and serve warm or cold.

In this article, I have shared with you ways to enjoy Montana's wildflowers. Since making Montana my home five years ago, I have enjoyed peaceful days in the field identifying and photographing the flowers. Wildflower bouquets have brightened my home; wild berry desserts and jams have garnished my table.

But I possess no monopoly on this pleasure. The flowers are there for all to enjoy. Please help yourself.

WHEN HUNTING FLOWERS ON . . .

Private lands—Check with the landowner.

National Parks—No wildflowers may be picked by individuals. Universities may ask and receive permission to remove some specimens for scientific purposes.

National Forest and Bureau of Land Management lands—No restrictions exist, but research natural areas and botanical areas should be avoided. If unaware of the location of these areas, check with local authorities.

(In all areas, rare and endangered plant species [e.g., bog-orchids] should be left undisturbed.)

ADDITIONAL READING

The following are more detailed field guides for identifying Montana's wildflowers. Many wildflower enthusiasts carry one afield or keep one in the car.

Craighead, J.J.; Craighead, Jr., F.C. and Davis, R.J., 1963. "A Field Guide to Rocky Mountain Wildflowers." Riverside Press: Cambridge, Mass., $5.95. Included in the Peterson field guide series, excellent pictures, descriptions and discussion of related species. Most extensive field guide for Rocky Mountain area.

Zim, H.S., and Martin, A.C., 1950. "A Guide to Familiar American Wildflowers." Golden Press: New York, $1.50. A small paperback field guide, listed by related species, includes maps and color drawings.

Hagener, L.W., 1972. "Wildflowers, Shrubs and trees of North Central Montana." Botany Dept., Northern Montana College, $4. A small paperback of common prairie flowers, listed by flowering times.

McDougall, W.B., and Baggley, H.A., 1956. "The Plants of Yellowstone National Park." Yellowstone Library and Museum Assn.: Yellowstone National Park, $1.50.

Nelson, A.G., 1970. "Wildflowers of Glacier National Park." Great Falls, Mont., $1.50. Paperback, approximately 80 species, color illustrations.

Reiner, R.E., 1969. "Introducing the Flowering Beauty of Glacier National Park and the Majestic High Rockies." Glacier Park, Inc. Color keyed with two pictures (close-up and field) of each species; 133 pages illustrating 125 species.

Shaw, R., 1974. "Plants of Yellowstone National Park and Grand Teton National Park." Wheelwright Lithographing Co.: Salt Lake City, $3.95 projected price. Treats over 200 species of trees, shrubs, ferns and herbs, color coded, will probably be ready for summer 1974.

continued

An article on wildflowers wouldn't be complete without a photo of Montana's state flower, the bitterroot. photo by Don Aldrich

The glacier lily, also called "dogtooth violet," is often found as high as 10,000 feet, usually blooming soon after the snow disappears. Sometimes it even pokes its beautiful yellow flower through the snow. photo by H. Peder Waldum

...Consider the lilies of the field,
how they grow;
They toil not, neither do they spin:
And yet I say unto you
That even Solomon in all his glory
Was not arrayed like one of these.

Matthew 6:28-29

Long associated with springtime and Easter festivals, lilies—wild and cultivated—have universal appeal. Each geographic area has unique species, and Montana's lilies are among the most beautiful.

Botanists divide plants into families according to shared characteristics. All flowers in the lily family have three sepals, three petals, six stamens and one pistil (see drawing, page 20). Often the sepals are colored and look so nearly like petals that some lilies appear to have six petals, instead of three. Many lilies grow from bulbs, some of which are used for food. A few are poisonous.

Although Montana's lilies have these common characteristics, they nevertheless illustrate the great variety within one plant family.

Perhaps Montana's largest and best known lily is the beargrass. This creamy white lily, often associated with Glacier National Park, grows two to three feet tall. The basal leaves resemble grass, but are tough and sharp-edged. Northwest Indians dried and bleached these leaves and used them for baskets, thus giving beargrass another name—basket-grass or squawgrass. Beargrass plants grow singly or in bunches, often covering an entire hillside. The flowers appear from June to September, depending on the elevation.

Another lily, the nodding onion, is also common in Montana. This flavorful lily frequents open hillsides and moist-to-dry valleys. Its 25-40 small white flowers are clustered at the end of the stem and hang downward or to one side.

Many of the over 300 onion species—such as garlic, leek and chives—are used for food. All Montana onion species have been used by Indians and outdoorsmen to add special flavor to stews and meats.

Bulbs from many lilies were also used by Indians and early settlers for food—raw or cooked. When cooked, they tasted similar to potatoes.

Sego lily, the familiar white tuliplike flowers with a yellow and purple spot or crescent at the base of the petals, was popular with Mormons during lean years. Utah made it the state flower in commemoration.

Camas, a staple in many Indian diets, was probably the most widely used bulb. Camas and death-camas, although confusing before and after flowering, have distinctive flowers; the camas flowers are bright blue while death-camas flowers are yellow-white and smaller. The Indians only occasionally mistook the poisonous death-camas for true camas.

The yellow fritillary has a small, hanging, bell-shaped flower. A little digging soon yields the unique "bulb" with its 30-50 bulblets. A similar black lily in Alaska has been appropriately called "Indian rice."

Some Montana lilies are mainly known for their beauty. In the mountain foothills, the dogtooth violet or glacier lily with its yellow recurved petals heralds the coming of another spring. The beautiful wild lily-of-the-valley and false solomonseal combine clusters of white flowers with bright green foliage. Spring in the prairies means the arrival of the small sand lily, its flowers only a few inches tall.

Montana's lilies—large, small, delicious and beautiful—are yours to enjoy.

book reviews

FLOOR OF THE SKY by David Plowden, a Sierra Club Landform Book; San Francisco, New York, 1972; 128 pages, $19.75.

One has to live in the prairie country to fully understand the impact of David Plowden's words in his introductory chapter to "Floor of the Sky": "Except for the relatively few people who, for one good reason or another, happen to live where the land is stretched taut and dry across the center of the continent, North Americans are strangers to the plains."

As a transplant from the midwest to the great American steppe, I can fully appreciate and understand the subtle values of wide-open spaces.

Writing is defined by a purposed completion, the last paragraph. Yet, the best of it is never the final period, because then only review and editing remain. The best moments lie in the numerous vicarious experiences that a writer discovers in gathering data. It's this latter trait which the author expresses so well in his description of the Great Plains.

During the year and a half it took to complete "Floor of the Sky," Mr. Plowden transversed the 10 Great Plains states and made new acquaintances in small towns, ranches, railroad stations, grain elevators, and country stores—talking about the prairie over farm machinery, barbed wire fences and dusty country roads. From this blend of visits, observations, field notes, photographs and personal impressions come a vivid portrayal of what prairie country is really like.

Covering a topic like the great American steppe is an awesome undertaking. But the author—through the aid of sensitive photographs meshing essential elements such as physiography, history, Indians, transitory stages of the prairie and ecological resources—gives the reader a better understanding of the Great Plains and its people.

I was disappointed that Mr. Plowden did not devote a chapter to coal and oil shale development and its related future impact. John G. Mitchell's introduction to the book touches on the topic, but it dies here. Mr. Plowden's sojourns should have revealed on ominous change in the life style of the plains peoples and alteration of their landscape by such development.

But for the present, Mr. Plowden's vivid rhetoric summarizes the many attributes of the prairie . . . "It's the kind of place that can make a man feel small, which is the way a man should feel when his roof is the sky. But to be small out there is not to be insignificant. For some, it is to possess the intuitive ability to see oneself in scale—a gift so often denied those who dwell under conventional roofs in the city of man."—*Ken Walcheck*

BOOKS RECEIVED —reviewed in brief—

NORTH AMERICAN BICYCLE ATLAS (second edition) by Warren Asa, American Youth Hostels, Inc., New York; 1972, 126 pages, no price listed, paper.

This book lists bicycle tours, arranged geographically from west to east, and graded for difficulty. It also contains general information about bicycle touring, needed equipment, where to stay, conditioning, etc. The book doesn't try to answer all questions. It's a starting point, directing attention to the color and attractions of various regions.

NATURAL FOODS COOKBOOK by Maxine Atwater, illustrated by Craig Torlucci, Nitty Gritty Books; Concord, Calif., 1972, 174 pages, paper, no price listed.

Simple and attractive—those words describe the recipes and the book itself. This book differs from most natural food cookbooks because it provides a list of substitutions you can make in everyday recipes. Some of the ingredients are a bit exotic, but readily obtainable in these days of the health food craze. Sections on appetizers, soups, eggs and cheese, vegetables, fish, chicken, meat and salads are featured.

SPRINGBOARD

"We not only know reclamation *can* work. We know it *is* working."—*Montana Power Co.* (no emphasis added)

"In the American West not enough water exists for large-scale conversion of coal to other energy forms. The potential environmental and social impacts of the use of water for large-scale energy conversion projects would exceed by far the anticipated impact of mining alone."—*National Academy of Science Study Committee.*

FOR DISCUSSION

contributors

Cathy Ellis is the author of the cover article on wildflowers—beginning on page 19—which is also the third *Montana Outdoors* "Recreation Guide." Mrs. Ellis holds a B.S. degree in zoology and botany from Brigham Young University in Provo, Utah and has taught high school biology. In addition to being a housewife and mother, she has assisted her husband, David, with research on golden eagle behavior.

MO welcomes the photographic work of H. Peder Waldum in the wildflowers article. His color photographs include some of Montana's rarest species—and some of the most difficult to capture with a camera. Waldum is pastor of Bethlehem Lutheran Church, Kalispell.

Phillip Stewart takes on the task of explaining to the layman the importance of aquatic invertebrates—little critters without backbones which provide food for many fish species. His article begins on page 31. Stewart holds B.S. and M.S. degrees in fisheries management from the University of Arizona, Tucson, and a Ph.D. in fisheries science from Colorado State University in Fort Collins. He is a planning ecologist for the department, headquartered in Columbus.

If you've never heard anybody compliment a worm for its shape, turn to page 36. Vern Craig points out that the worm's "long, tapered physique" is just right for life in the soil. He then provides instructions for raising your own healthy wigglers. A special assistant in the department's environment and information division, Craig is also a frequent contributor of cartoons and articles.

We have a state flower, bird and tree and soon we may have a state fish. So Loren Bahls thinks we should have a state water plant and he nominates a banana-shaped diatom for the honor. Check page 40 if you're curious about the diatom's qualifications. When he's not humorously examining the gunk—algae—covering the rocks in his favorite stream, he's a staff ecologist for the Montana Environmental Quality Council. He earned a B.S. degree in fish and wildlife from the University of Minnesota, St. Paul/Minneapolis, and a Ph.D. in botany from Montana State University, Bozeman.

Electrofishing—fish shocking—is a valuable technique for gathering information about fish abundance. Bob Needham, regional fisheries manager for the department in Glasgow, explains exactly how fisheries biologists go about gathering this information and how it's used in formulating fish management programs. His article begins on page 38. Needham holds B.S. and M.S. degrees in fisheries and wildlife management from Montana State University.

SUBDIV which side

"I think these land developers should be brought to a screeching halt."

The article, "The Subdividers are Here" (Jan./Feb. 1974), brought an unparalleled response from our readers. Letters ran about five to one in favor of the article. (Some even thought we should have taken a stronger stand.) However, the feature also caused some controversy, mostly because the real estate industry strongly objected to the accompanying illustration.

Here we have included critical and favorable letters in about

SIGNS OF THE TIMES

Congratulations on the well-written article, "The Subdividers are Coming," in the Jan./Feb. 1974 *Montana Outdoors*. It is encouraging to see an article that really tells it like it is in these days of rapid, unplanned development in western Montana.

It is unfortunate that an article like this needs to be written at all, but the photographs on the cover and throughout the article are certainly signs of the times in the Flathead Valley. They are constant reminders that the quality of life as we now know it in the Flathead is surely slipping away, as is the case throughout the state. With articles such as yours, other concerned people hopefully will be made more aware of the unwise land development problems occurring around us, and will want to speak out for orderly, planned growth. To assume that the subdivider recognizes key winter game range and prime agricultural land as a constraint to subdivision is a myth. These attractions are disappearing, along with our quality of life.

Again, Flathead Tomorrow commends you on your thorough analysis of the land development situation; we look forward to the second part of the article.—*Kathryn D. Thompson, chairman, Flathead Tomorrow; Bigfork, Mont.*

CONGRATULATIONS

Congratulations to the Department of Fish and Game for the wisdom to judge land use on its contributions to the quality of life rather than its impact on economic curves.

The article recognizes the often forgotten, yet terribly significant fact, that humans have needs transcending the economic and technological. The real biological necessities of quiet, initiative, independence and open space are in critical supply. These needs are no more frills or luxuries than are food and shelter. Perhaps the intangibles of fish and wildlife are too ethereal for economic study, but they are profound indicators of the quality of life.

The Flathead Valley's land use patterns are becoming a nightmare because they are not based on the total requirements of man's biological nature and his cultural evolution. Land use in the Flathead is concerned chiefly with economic criteria.

Many of Mr. Schneider's critics—and critics of the environmental movement in general—chant their concern for man. They tell us they "favor men over fish," or are only "concerned with producing decent shelter for moderate and low income families." They forget, or choose to ignore, that the environment is an integrated ecological system in which the welfare of any part of the system depends on the welfare of the rest. They deny man is part of the system and therefore cannot achieve and maintain physical and mental health if all parts of the system are not healthy.

Microbiologist and Pulitzer Prize winner René Dubos warns that the greatest danger to environmental decisions based solely on economics and technology is that human beings can make adjustments to almost anything. Polluted, ugly and heartless environments are compatible with economic growth and political power. Sadly, our beautiful valley is already carved up and hawked to the highest bidder. For some, humanity is so crippled that the most crass and ugly development no longer offends.

Early last spring a friend and I scrambled over the snowy Noisy Creek notch in the Jewel Basin east of Kalispell. Looking out over Twin Lakes, two small lakes among the trees, I commented to my friend how fortunate we were to own public lands such as these. My friend looked puzzled and said he suspected that ownership of land was a concept long abused by man. He looked down at the partially frozen Twin Lakes and said, "Man thinking he owns land is like ice thinking it owns the water." I am grateful for the simple beauty of that thought.—*Bob Muth; Kalispell, Mont.*

BEST I'VE READ

I have just read "The Subdividers are Here," in the Jan./Feb. 1974 *Montana Outdoors*. As one who has dealt with various aspects of the subdivision problem in Montana over the past few years, I can say that this is the most meaningful analysis of the relationship between subdivision development and the loss of environmental quality that I have ever read.

You did an excellent job of illustrating the inadequacy of our current laws (SB 208 and HB 465) to protect wildlife resources. In so doing, you provided the rationale for amending these laws so that subdivision decision-making may be based upon the broad range of environmental factors, rather than narrowly construed sewer and water considerations.

While the entire article is a bright spot to one used to meaningless "compromise" statements (e.g., "We can have both economic growth and environmental quality so long as we have sound planning . . .), I would like to give special recognition to the appropriateness of the "mini-editorial" on page 40. I have seen too many developers use a lavishly illustrated environmental analysis as a tool of legitimacy to cover up their real motives of short-term profiteering at the land's expense. The inescapable fact is that when one decides to parcelize land as a commodity, he sets into motion a series of interrelated impacts which can only compromise the natural integrity of the land upon which we all depend. We cannot have our cake and eat it too, as far as subdivision is concerned.

I am greatly encouraged by the stand you have taken in this article and I urge you to maintain that stand for this and future generations.—*William P. Cunningham; Helena, Mont.*

DEVELOPERS DISREGARD THE COMMUNITY

I would like to congratulate you on the excellent article on subdivisions which appeared in the Jan./Feb. 1974 issue of *Montana Outdoors*. I'm looking forward to the next installment.

A group recently formed the nucleus of what we hope to be a continuing organization called West Valley Landowners Assn. It soon became evident that considerable

continued

ISIONS

are you on?

"I think we need subdivisions . . ."

the same ratio as we received them. There were so many letters that we couldn't possibly use all of them because of space limitations. We'll print more of them next time, so if you wrote one that doesn't appear here, we hope you won't be upset. Regardless of your views, your words were appreciated. Our future efforts to expose activities which degrade Montana's fish and wildlife habitat depend on solid public support.—*Ed.*

REALTORS EXPRESS DISPLEASURE

By invitation of the editor of *Montana Outdoors*, the Flathead Board of Realtors takes this opportunity to publicly voice its displeasure with the article, "The Subdividers Are Here," in the Jan./Feb. 1974 issue. The article, in its entirety, infers by words and illustration that Montana realtors—and especially those in the Flathead area—are responsible for the direction which subdivision and development are taking in the state.

It seems there is some misunderstanding of the definition and function of a realtor. We are not primarily subdividers or developers! We, as realtors, whether as broker or salesman, are active members of the local, state and national Association of Real Estate Boards, an organization incorporated in 1908 to promote the interest of the real estate profession and protection of the public from unprincipled agents. We subscribe to a strict code of ethics. Our role is governed entirely by the concept of agency which sets forth the duties and responsibilities of principal or owner to agent and vice versa. Underlying this whole concept is the fact that the agent is acting exclusively as the representative of the owner in finding buyers for listed properties. The use of land or real estate of any kind should be according to the wishes of the owner, within the guidelines set by concern for the general welfare.

We are willing to share the responsibility for proper land use, not only as realtors but as everyday citizens. We understand and appreciate the concern the Department of Fish and Game expresses for proper land use and the general welfare. However, we resent being used as a whipping post! We feel strongly that the number one requirement for orderly growth in any region is a comprehensive plan which calls for areawide zoning. We have been among the first and last to recommend it. We are willing to boost anything or anyone that contributes to this so-called master plan.

Now let us proceed to work together to (1) promote development of a comprehensive plan, (2) support legislation necessary for the implementation of it and (3) guide subdividers and developers in the right direction to the benefit of everyone.—*Robert Borden, president; Flathead Board of Realtors; Kalispell, Mont.*

WE MUST BE REASONABLE

I read the Jan./Feb. 1974 issue of *Montana Outdoors*, the official publication of the Montana Department of Fish and Game. It looks as though Bill Schneider is interested in keeping all of Montana unpopulated so F&G can bring in a hoard of out-of-state hunters to have a ball and hunt our game and catch our fish. They do more harm and disrupt more of our game than most of us natives do. Of course F&G charges them a fee in the form of a license so they can finance various projects to make hunting more enjoyable for these out-of-staters who come back next year. I wonder if the editor knows where all the big salaries will come from to pay F&G employes if people don't own land and pay taxes.

Mr. Schneider makes reference to Oregon discouraging new residents or even visitors, and suggests Montana do likewise. Perhaps Oregon has enough industry to support its government; Montana depends on tourists to help support its economy and to pay the salaries of these employes of the Department of Fish and Game. One also wonders what it cost the taxpayers of Montana for the time and expense used to take all of those pictures of signs of businesses or individuals having property for sale.

Mr. Schneider also stated in the article that one bright spot in the darkness was the Montana Floodway Act. I wonder if he has thought how much money and hardship this has caused—and will cause—the people of the Flathead area.

Perhaps Mr. Schneider was born and raised in a city. Because he chooses to live in a town, he thinks all people in Montana should be forced into towns also. He is advocating that property should be taken away from private ownership by saying that privately owned land is not a commodity for the exclusive use of its keeper, but rather a public resource. We pay for our land from hard earned money and pay taxes on it and should be able to use and manage it in the way we want to.

About 80 per cent of the land in Flathead County is in public ownership and another 8 per cent is owned by big lumber companies. This leaves only 12 per cent privately owned. We are living in Montana because we want to be free to choose our way of life, whether it be to live in town or in the country. Those that don't want this should move to a socialistic country and not stay in our country where we have established a democratic way of life.

The editor states that everyone with a summer cabin should be penalized by extremely high taxes. Why? So he would be forced to give up his property and leave it so other people who have not worked and paid for this land may use it?

It seems as though the Department of Fish and Game wants to take all private land in the state and turn it over to the hunters and fishermen. There are other ways of enjoying property too, such as swimming in a clear lake, going to sleep in your cabin while listening to the waves splash on shore, hearing the wind blow through the pine trees overhead or just enjoying the peace and contentment of relaxing on your own little part of America.

It also states in the article that the little guy (as he is called) should be driven out of business because big outfits can do a better job. This is something we are strongly against. It is being done in all big industry now and we must not let this encompass our whole way of living. As far as we Americans are concerned, a dictatorship is not a good way of life.

Assessments in Flathead County have more than doubled in the past 10 years, increasing from $17,000 to $36,000, largely because the land has been divided and improvements made on it.

It is a fact that realtors and developers recognize the need of good planning, which we agree has not always been the case. But we all must be reasonable and work together on this and not let our state and nation become a socialistic dictatorship. We must maintain our American rights. A good plan can be acceptable to

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interest existed relative to subdividing in general and the proposed Deer Meadows subdivision in particular. Consequently, we called a public meeting for Jan. 7 with all property owners in School District 1 urged to attend. (There are about 109 landowners in the district and over 150 people attended the meeting.)

The two main impressions I gained from the meeting were: (1) the utter disregard of the developers for the environment and economy of the community and (2) the complete ineptness of the City-County Planning Board in preparing the staff report for the public hearing held Aug. 8. (The hearing was held after an intentional minimum of publicity. Very few people knew about it.)

I asked Steve Petrini (Areawide Planning Organization) where he came up with the statement in the staff report that, "This area was not a part of big game winter range." He said this review took place in July and he wasn't sure how to read signs of winter range but that he and two of his staff had walked over the area and couldn't fine any antlers. I brought up the point that as a last resort he could ask some of the people living nearby. I then asked for a show of hands from people having knowledge that this was winter range and nearly everyone at the meeting raised his hand.

After several other people questioned George Ostrom (one of the Deer Meadows developers) about this being prime winter range, he made the statement that while he was aware of the possible economic impact on the school, "The whitetail deer matter is not germane to this subdivision problem." I certainly hope he gets a chance to reflect on this statement since he is supposedly a great sportsman and conservationist. In fact, I understand he served on the Wild and Scenic Rivers Study Committee.

The impression that we as a committee formed from the meeting was that this subdivision is in trouble and will have to—at minimum—go to 10-acre tracts to get any type of approval from the school board and county commissioners.—*Howard A. Stockwell; Kalispell, Mont.*

IT HAPPENED IN MICHIGAN

I would like to take time to thank all of you who work so hard to take care of our wildlife. I enjoy reading the fine magazine you put out. You do a fine job of presenting both sides of controversial subjects. I would like to comment on just a couple of things.

I've lived here in Michigan all my life. We live on a small farm about 35 miles southwest of Detroit. I work in an automobile factory for GM. I feel this gives me an insight into some of our problems. I've watched factories come into our area. After the factories came the people. After the people came, they built houses and most of them built in and around the cities and factories.

With all these people, our schools are overcrowded. We ran into all kinds of water and sewage problems. People want all the roads to be hard top. This all cost money—in taxes.

We out here on the farm didn't pay too much attention. But one day the people in the cities were told they could move out into the country and get away from the big ugly city and all its miseries. So realtors moved in quickly and bought up farms and then subdivided them. It wasn't long before our schools were overflowing. We have sanitation problems. Our taxes are so high now that farmers can't pay them and they are selling out at a rate of 40,000 acres a year here in Michigan. Now the big thing is to buy property in the north county. You guessed it—our friendly realtors are at it again. We tried to pass laws to stop them. But they have such a powerful lobby, we haven't been able to stop them.

I can't stand the thought that the same thing could happen to you people. Don't fall for some smooth talkin' dude from the East. He can promise a lot of things. But you can be sure of only one thing; he is after money. He could care less what the place looks like after he gets his money.

I would like to make one more suggestion. Keep your hunting quota down to insure a quality hunt. To do this, please go to drawings or just set quotas. But please don't raise the prices to discourage people. There are a lot of us who enjoy coming to your fine state. We have to scrape up a lot of pennies.—*Robert A. Elka; Willis, Mich.*

SIGN ME UP

I heard your comments over television last Friday (Feb. 8, 1974). Please state the amount for a subscription to your magazine. I want to subscribe. I think these land developers should be brought to a screeching halt.—*Grant T. Cunningham; West Glacier, Mont.*

CALIFORNIAN AGREES

Although I am a resident of the state of California, I am still in love with Montana where my childhood was spent. It is a pleasure to read your magazine—after living here among ecological horrors, I am so pleased to read that Montana is becoming aware of what destruction so-called "progress" can heap upon the environment.—*Lesley Clark; Oakland, Calif.*

CRUSADE FOR TRUTH

The membership of Flathead Wildlife, Inc. wishes to commend you on your article, "The Subdividers are Here." You are on target from start to finish and we hope you continue with your crusade for truth.

I am a native of this state but I spent 23 years in southern California. I have had a front-row view of the ruthless (and many times criminal) practices of developers.—*Monty Kennedy, secretary; Flathead Wildlife, Inc.; Kalispell, Mont.*

continued from page 29

all concerned. However, this cannot be if we allow our tax-paid governmental employes to spend our money and think along the lines presented in the *Montana Outdoors* article.—*L.A. Waters; Kalispell, Mont.*

☐ *As we've pointed out several times in* Montana Outdoors, *the Dept. of Fish and Game does not depend on Montana's tax dollars. Instead, department projects rely on license fees and federal matching funds from excise taxes on sporting equipment.*—Ed.

SUBDIVIDING NOT SERIOUS

First, one gets the impression that all of western Montana will soon be wall-to-wall houses. For one thing, only a small amount of land is available for subdividing and of that, only a small portion is suitable for subdivisions. Your logic of generalizing and then applying what happened in Flathead County to the rest of western Montana was improper. In Sanders County last year, there were four subdivisions approved, with 637.19 acres involved. That is .03 per cent of the total land in the county, or .I per cent of the total land available for subdivision by small and large private land owners. At last year's rate, it will take 857 years for all of that land to be subdivided—suitable or not—leaving the county with only 1,272,029 acres left for wildlife.

I would also like you to reconsider your statement that the "big outfits . . . do a better job." Those very people—the big corporations—are the ones who are responsible for the largest portion of the ecological havoc going on today. Those big developers may have more money to put into a subdivision, but that just means they are all the more anxious to divide, sell fast and get out with their big money. And all that money they put into the subdivision is going to push the price beyond the reach of the common person. Instead of an Abrahamic concept of land, you are proposing a return to the feudal system, where only the very rich can be landowners. That will hardly foster development of an attitude of community with the land.

Your quote by Aldo Leopold at the end of the article contradicts your earlier proposed changes in the tax structure. A severe tax crunch on living outside the city limits in Sand County [the Wisconsin area in which Leopold resided] would have prohibited development of Mr. Leopold's "caring attitude" for the land. People don't learn to belong to the land when they are living in towns.

I would also like to question your plan for controlling subdivisions by imposing a "severe tax crunch on the second home in the country." Those who own cabins in the woods are generally there for only a few weeks out of the year, which shouldn't cause much of a conflict with the local wildlife. Those who do live on their land year round must love and respect it; there would be no other reason for them to try and survive the impact of the seasons.—*Trisha Work; Plains, Mont.*

AQUATIC INVERTEBRATES

why anglers should care about them

By Dr. Phillip Stewart

illustrations by Donito Eaton

HOW MANY ANGLERS realize fish populations depend on a large, diverse group of small—sometimes microscopic—creatures? And how many realize that some of these critters without backbones are so delicate that a small change in chemical or physical environment can eliminate them? It doesn't take much logic to deduce that without these aquatic invertebrates, the fish which feed on them wouldn't survive.

Extremely diverse, this group contains mostly marine species. But even in fresh water, the diversity of sizes, forms, habitats, life cycles and behavior is tremendous. Many types of fresh-water invertebrates are infrequent fish foods. But several others compose the major portion of many fish diets.

Lakes and ponds host three major habitats for aquatic invertebrates:

- Planktonic organisms spend the entire life cycle suspended in open lake waters. Only dead plankton or their resting eggs are found on the lake bottom.
- Littoral organisms live on the bottom of shallow shore areas or in and on shore vegetation.
- A few aquatic invertebrates are typically found on the bottom (benthic organisms) in deep lake waters.

Most stream invertebrates, on the other hand, live on or under rocks, burrow in sand or muck, live on vegetation, simply sprawl on various types of substrata, or exist in association with the streambed. A few types (discussed later) inhabit the surface of slow-moving streams.

Acknowledging that many volumes exist on the kind of fly wily trout prefer, in reality very little is known about fresh-water invertebrates. Many aquatic invertebrates are still unrecognized and unclassified. Entomologists know many insects only because of the land-dwelling adults. Little—or nothing—is known about the immature, aquatic forms. Individual species remain unidentified, and ecological interrelationships among species are, at best, poorly understood.

The simple fact is: *Without aquatic invertebrates, there would be no fresh-water fish.* Trout and many other game fish use invertebrates throughout their life cycles. They often provide the first food for fish-eating species, and some forage fish eat only aquatic invertebrates. (Land invertebrates—especially land insects—also become important fish food when they reach streams and rivers.)

Thus, the number of aquatic invertebrates affects production of fish in lakes and streams.

Anchor a fine mesh net in the current of a stream and it soon fills with aquatic insects and possibly crustaceans. The net will probably fill most rapidly during early morning or evening hours. This demonstrates a fact not recognized until the 1950s—that many bottom-dwelling organisms constantly drift downstream with the current. Why do they leave their stream bottom habitat? Most likely, these organisms drift because of competition for suitable stream bottom habitat. The drifting organisms are losers of that competition. The drift removes organisms that exceed the carrying capacity of the stream bottom. Most drifters quickly die—carried to unsuitable habitat or eaten by fish. These drifting organisms are extensively harvested by stream trout and other fish.

In addition to providing fish food, aquatic invertebrates serve as valuable indicators of a quality environment. Highly sensitive to all conditions in their environment, aquatic insects are especially responsive to chemical changes. This makes them champion pollution indicators. Chemical pollutants drastically alter numbers and kinds of invertebrates. This should strike home with the angler—pollution reduces fish by decreasing their food supply.

Different pollutants affect aquatic invertebrates differently. In sufficient concentrations, some pollutants kill most invertebrates outright. Other pollutants—depending on concentration—act more selectively and kill most of some invertebrates and fewer numbers of others.

Some pollutants change the composition of invertebrate communities by causing increases in some groups and decreases in others. Organic materials (such as domestic sewage) have this effect. When domestic sewage pours into a stream, the number of invertebrates downstream usually increases. That's only part of it, however. The number of *species* present upstream would exceed the number of species downstream from the sewage source. In other words, sewage *decreases diversity* of the invertebrate community. Just as many—or more—individual invertebrates may be present, but fewer

continued

species will be represented. Moreover, downstream and upstream areas have few species in common. Decomposing sewage consumes dissolved oxygen which is often needed by invertebrates. Sewage also introduces plant nutrients which change aquatic plant communities, affecting invertebrates, and, in turn, affecting fish.

Toxic materials (pesticides, metals, etc.) also affect aquatic invertebrates although in a different manner than sewage. In sufficient concentration, these substances destroy almost all types of invertebrates. At lesser concentrations, depending on the material, many groups are hit hard. Effects of toxic pollutants on aquatic invertebrates have been studied extensively. But results are often complicated and difficult to interpret because of differences in water chemistry. Pollutants influence invertebrates many miles downstream from point of introduction, decreasing in severity as pollutants dilute.

High levels of silt and other soil derivatives introduced into streams should be considered physical rather than chemical pollutants. These materials settle between rocks and gravel, filling up space used by aquatic invertebrates. This also reduces invertebrate numbers, especially in some groups most important as fish food.

But all unnatural disruptions of natural water conditions—silt, sewage, metals, etc.—have a serious and long-lasting impact on aquatic invertebrate populations. In turn, that impact transfers to fish populations.

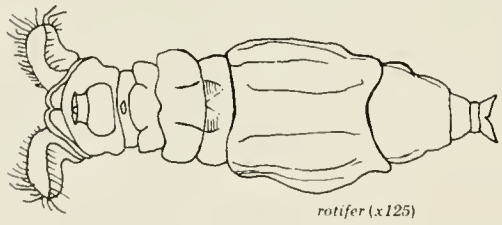
The remainder of this article discusses groups of aquatic invertebrates most important as fish food. The following is a classification scheme for the groups discussed.

Phylum Rotatoria (rotifers)
Phylum Annelida (aquatic earthworms and leeches)
Phylum Arthropoda (jointed-leg animals)
  Class Crustacea (arthropods with two pair of antennae)
    Order Cladocera (water fleas)
    Order Copepoda (copepods)
    Order Amphipoda (scuds)
  Class Insecta (insects)
    Order Plecoptera (stoneflies)
    Order Ephemeroptera (mayflies)
    Order Odonata (dragonflies and damselflies)
    Order Hemiptera (bugs)
    Order Trichoptera (caddisflies)
    Order Diptera (two-winged flies)

(Invertebrate zoologists use terms that even the serious student masters only with difficulty. Most of that terminology will be avoided here—that used will be defined. Perhaps frequent references to the appropriate illustration will help.—*Ed.*)

Phylum Rotatoria
(rotifers)

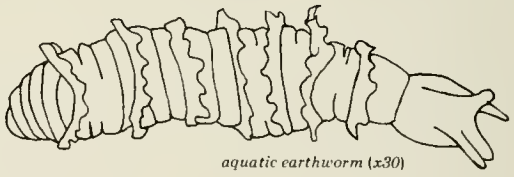
Microscopic animals no more than one-fiftieth of an inch long and usually less. Abundant in both open water and shore areas of lakes and ponds. Possess most basic organ systems found in higher animals. Named for ciliated (covered with hairlike projections) head end resembling a pair of revolving wheels. Cilia beat together to provide locomotion and filter out microscopic food particles from the water. Densities reach several hundred per quart in open lake waters. Provide important food for most young fish and fish feeding on microscopic animals.



rotifer (x125)

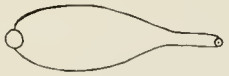
Phylum Annelida
(aquatic earthworms and leeches)

Similar to land cousins except maximum length usually doesn't exceed one inch. Found in mud and debris of lakes, ponds and streams. Feed like the land forms—simply ingest the substrata. Part of the diet of many species of bottom-feeding fish. One family tolerates depressed concentrations of dissolved oxygen; large numbers of this family indicate pollution from sewage.



aquatic earthworm (x30)

Leeches mostly predators or scavengers. Incidental part of many fish diets. Few take blood from mammals. Other species external fish parasites. All leeches have 34 true segments. Range in length from two-tenths of an inch to eighteen inches.



typical leech (actual size)

Phylum Arthropoda
(jointed-leg animals)

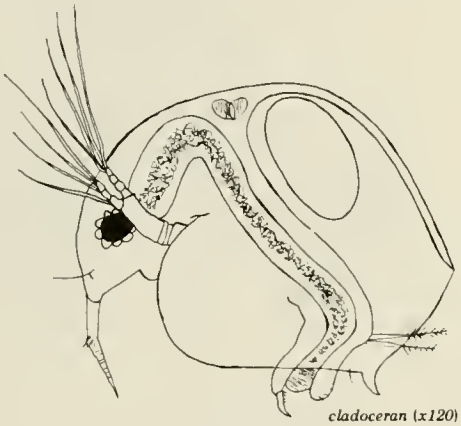
Jointed leg—key arthropod characteristic. (All of the following organisms belong to this phylum.) Have outside skeletons. Outer skin layer secretes exoskeleton of stout rings which does not grow with the animal. As growth progresses, new exoskeleton of soft, folded, flexible material formed inside the old. Old exoskeleton splits, the animal emerges from it, and the new exoskeleton unfolds and hardens. Entire process called molting. Some species molt as many as 40 times in a lifetime. Young often lack adult body parts and differ in shape from adult. With each molt, shape changes and additional body parts may be added (metamorphosis).

Class Crustacea

Aquatic arthropods. Most are marine, but fresh-water forms important. Most multicellular organisms living suspended in open lake waters are crustaceans. Have two pair of antennae, respiration by gills and general body surface; body segments with paired, jointed appendages and a nauplius larval stage in some groups. Nauplius larva formed directly from the egg. Doesn't resemble the adult. Increases in size and length and develops additional legs with each molt. Lives suspended in the water, feeds on microscopic plants and debris, has one median eye.

Order Cladocera
(water fleas)

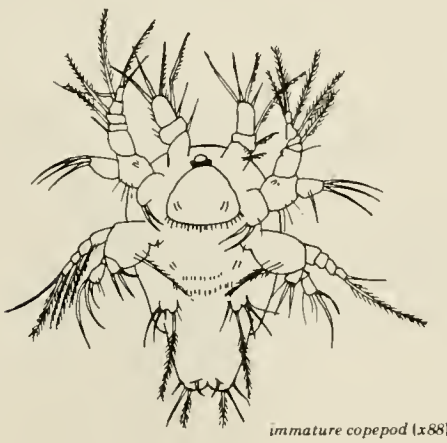
Barely visible to the unaided eye. May reach one-eighth of an inch long. Second set of antennae beat to produce limited movement. Legs of the thorax produce water current from which minute hairs on the legs filter out microscopic plants, animals and various dead materials. Most are female and live only a few weeks. Males fertilize eggs which do not develop immediately. Inhabit lakes and ponds. Important part of the animal plankton in open lake waters. Some species abundant in shore vegetation. Populations peak in spring and fall. Densities up to 500 per quart in open lake waters. Important food to fish of all sizes.



cladoceran (x120)

Order Copepoda

Similar to cladocerans in habitat, food and size. Body elongated and cylindrical. Most microscopic, but some reach one-sixteenth of an inch. Shallow water species rake and seize food from the bottom and from vegetation. Open water species filter feed. Reproduction entirely by union of sperm and egg. Female stores sperm for several weeks before eggs are fertilized. Important food to lake fishes. Open water densities reach 1,000 per quart.

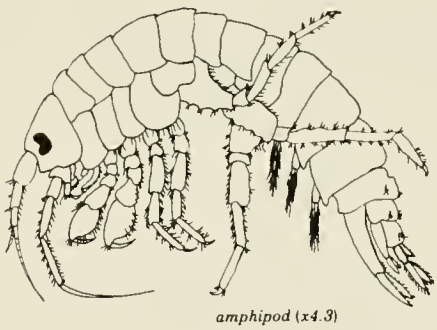


immature copepod (x88)

copepod (x28)

Order Amphipoda
(scuds)

Small (one-fourth to one-half inch long) crustaceans. Frequent shallow bottom areas of streams, ponds, lakes. Active at night, crawling or swimming over the bottom or vegetation. Erroneously called fresh-water shrimp. Eat plant and animal material. Not predators. After fertilization, female carries eggs in a body pouch until hatching. In streams, densities up to 1,000 per square foot. Important fish food wherever found.



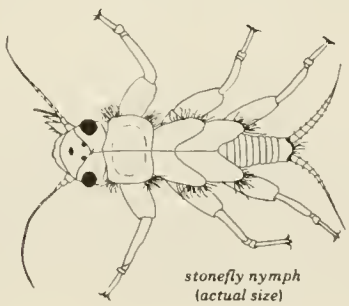
amphipod (x4.3)

Class Insecta

About a million species recognized—more than all other animal species combined. Most live on land, but found in every type of fresh-water habitat. Usually the most abundant animal visible with the unaided eye in streams and rivers. Distinguished from crustaceans by two pair of wings (in the adult) and one pair of antennae. Basic respiration by internal, many-branched air ducts to internal tissues. Often with external gills connecting with internal air duct system.

Order Plecoptera
(stoneflies)

Adults terrestrial, but usually found near water. Length ranges from one-fourth of an inch to two inches. Found on bottoms of swift streams and wave-swept lake shoals. Distinguished by two claws at the end of each leg and two long tail-like appendages. Some carnivorous. Others feed on algae and organic debris. Nymphs require abundant dissolved oxygen, are highly sensitive to pollution and are heavily utilized by stream trout and other stream fishes.



stonefly nymph (actual size)

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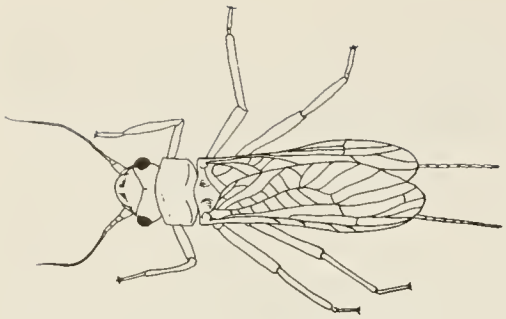
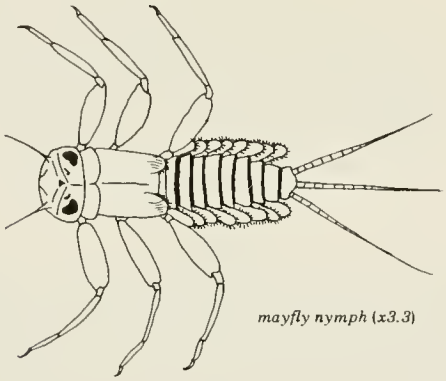


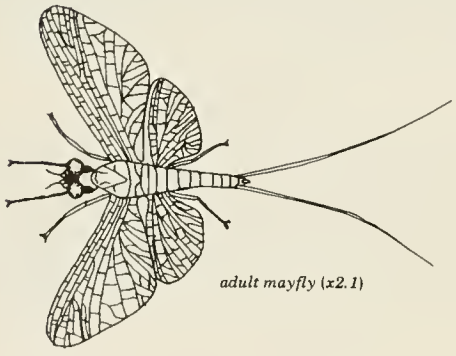
adult stonefly (x2)

Order Ephemeroptera
(mayflies)

Distinguished by single claw at the end of each leg. Adult fly terrestrial, has nonfunctional mouth parts, takes no food and lives only a few days. Mature nymphs up to an inch long, herbivorous and usually browse on bottom material. Live in lake and pond shallows and stream bottoms. Two molts occur after nymph leaves water. First produces a sub-adult which flies into vegetation and then molts again to produce the full adult. Heavily utilized as trout food.



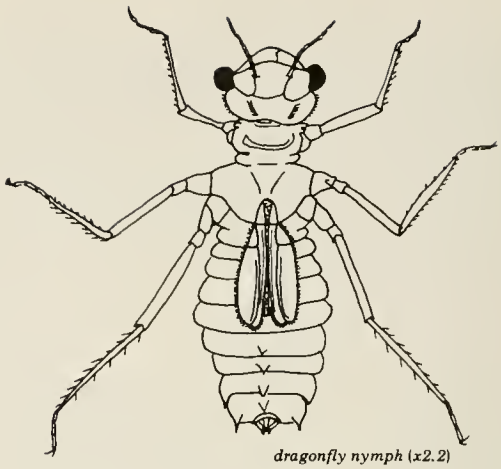
mayfly nymph (x3.3)



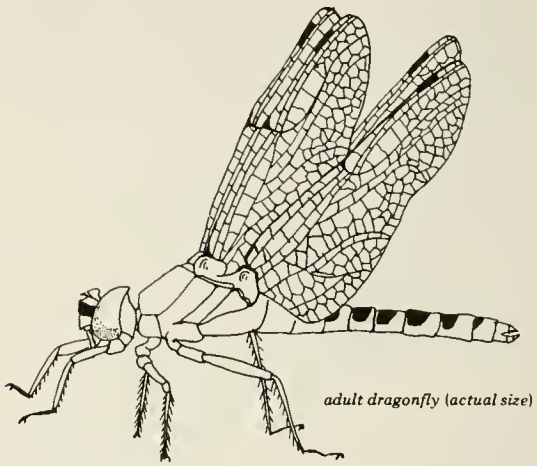
adult mayfly (x2.1)

Order Odonata
(dragonflies and damselfies)

Large with long, slender abdomens. Seen flying near shores of lakes, ponds and streams. Adults and nymphs entirely carnivorous. Distinguished by the labium, a mouth part extended for capturing prey. Nymph hatching from the egg is a spindle-legged creature differing considerably from the mature nymph. Succeeding molts yield a mature nymph, up to two inches long.



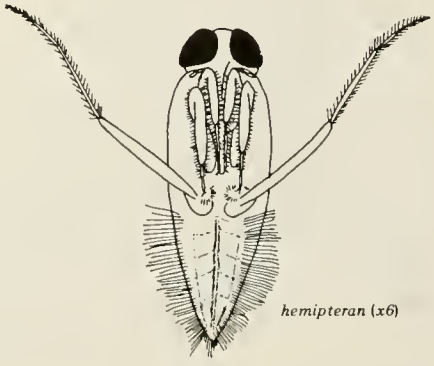
dragonfly nymph (x2.2)



adult dragonfly (actual size)

Order Hemiptera
(bugs)

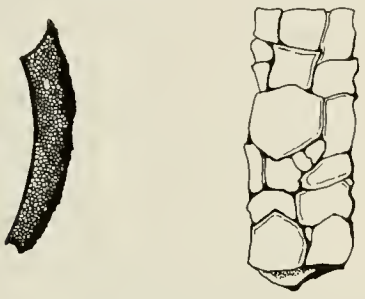
Few aquatic. Undergo gradual metamorphosis (early nymphs look like miniature adults). Mouth parts form beak used to suck body fluids of prey. Come to the surface for air or live at the surface. Diving forms carry an air bubble on the underside of body. Small insects and crustaceans usual food. Adult bugs vary from fraction of an inch to over three inches. Live in shallow, standing or slow-flowing water, but not fast streams. Usually incidental in fish diets.



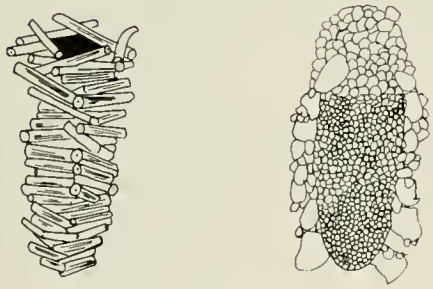
hemipteran (x6)

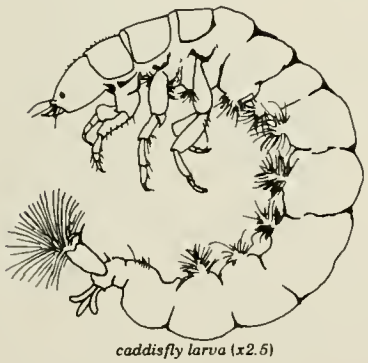
Order Trichoptera
(caddisflies)

Larvae construct hollow, often cylindrical "houses" or cases. Mouth secretes cementing substance to hold sand grains, small gravel or bits of leaves, bark or twigs together. Larva often completely hidden in case. Two hooks at the end of the abdomen anchor the larva in the case. Some do not build cases. Others build a silken net to capture food particles. Eat various plant and animal particles. Not predators. Inhabit fresh water. In streams cases usually "cemented" to stones. (Single stone sometimes covered with dozens of cases, many empty.) Larvae eaten by many fish, but most important to stream trout. Often eaten, case and all.

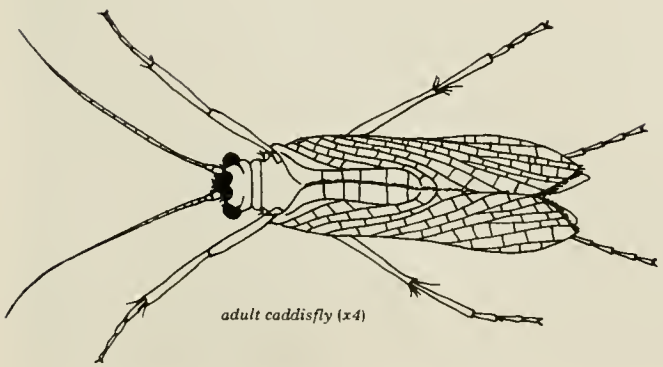


caddisfly cases





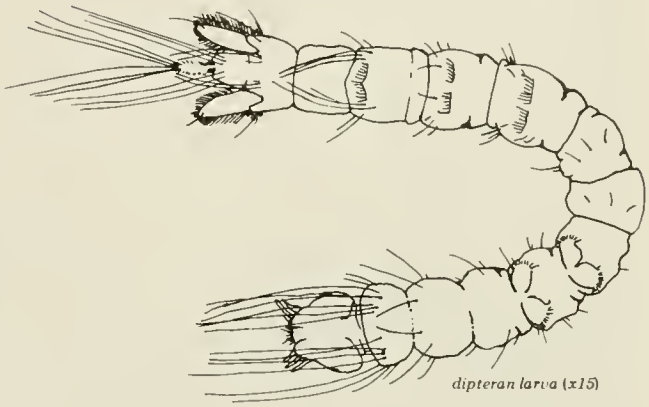
caddisfly larva (x2.5)



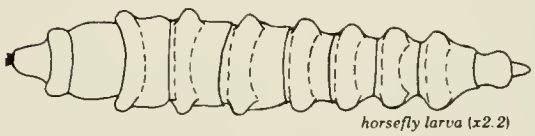
adult caddisfly (x4)

Order Diptera
(two-winged flies)

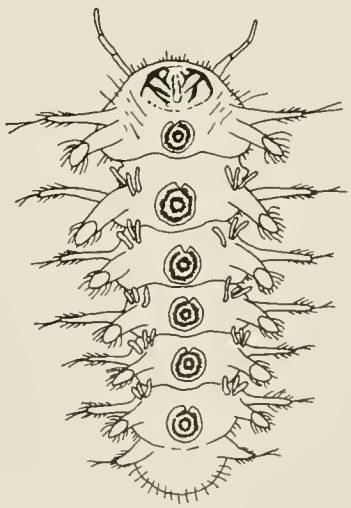
Includes mosquitoes, blackflies and horseflies. Mouth parts in adult modified for piercing and sucking. Larvae elongated, wormlike and lack both eyes and jointed legs on the thorax. Length varies from fraction of an inch to two inches. Feeding includes straining microscopic organisms and debris with bristlelike mouth parts, predation, scraping plant and animal debris from rocks and eating aquatic plants. Occupy all fresh-water habitats. Important in diet of almost every fresh-water fish.



dipteran larva (x15)



horsefly larva (x2.2)



dipteran larva (x7.3)

Much of the material for this article was taken from the book "Fresh-Water Invertebrates of the United States" by Robert W. Pennak (The Ronald Press Co., New York). This is probably the best available single reference. The interested reader should consult the various texts on limnology (study of fresh water and its biota). Small volumes on identification of fresh-water insects and other aquatic organisms are also available.

growing your own worms

By Vern Craig

IF YOU'RE A purist who believes that fishing isn't really sport unless the catch is made on an artificial tidbit, then you might find this article traumatic. But for brethren who consider themselves run-of-the-mill fishermen, common garden hackle—more affectionately called worms—provides an endearing bait. Home-grown worms afford a handy bait supply. Let's explore some of the methods for rearing the little wigglies.

Before considering techniques for raising a healthy worm, it would be good to become better acquainted. I can't remember anyone ever complimenting an earthworm's shape, except to say it fits a hook nicely. One might point out, though, that the long, tapered physique is admirably suited to a life in the soil.

The body is noticeably divided into a number of circular, ringlike segments. Each ring is mostly muscle. When these circular muscles constrict, the squeezing effect lengthens the worm's body. Now it needs something to pull it together again. A second layer of muscles under the rings runs lengthwise and shortens the body. Combined use of these two simple systems puts mobility and squirm in a worm.

FUELING THE WORM

On the front end of a worm, a heavy lip (prostomium) helps manipulate moistened food into its mouth. The food, primarily vegetable matter, is literally sucked in. A crop acts as a temporary storage bin and a husky gizzard grinds up the food between grains of sand. The intestine absorbs usable portions of the contents, which characteristically contain a large percentage of dirt. The discarded castings are very rich in plant nutrients.

Worms do not have lungs or any special breathing apparatus. The exchange of oxygen and carbon dioxide occurs through a thin, moist cuticle on the body wall. Heavy rains often "drown out" worms and force them to the surface. This happens when water removes free oxygen from the soil. Consequently, worms are unable to breathe. In water that holds much oxygen, worms can live for long periods.

Earthworms cannot see in the sense that they discern objects, but special cells are sensitive to light. The most sensitive area is

on the heavy lip. Light to worms is bad news and they draw away from it instantly. On warm days they may lie near the soil surface, but wait until darkness to emerge or partially emerge from their holes to forage and mate.

REPRODUCTION

Here is a condition to ponder—a creature with both male and female sex organs, both functional. The condition is known as monoecious. As darkness falls, the worms cautiously explore areas around their burrows. Still partially in the ground, they stretch to touch a neighbor who is ready to do his/her thing. Cloaked in a mantle of slime, each passes sperm to the other. The sperm is stored in seminal receptacles until needed to fertilize eggs.

On the foreward part of an earthworm there is a swollen area commonly referred to as a girdle, or packsack. Technically, it is known as a clitellum. When egg laying time comes, a slime tube is secreted around the clitellum and front end of the worm. Within this tube another secretion, the cocoon, forms over the clitellum. Eggs and albumin enter the cocoon. Both the cocoon and slime tube around it then slide forward on the worm's body. Sperm to fertilize the eggs flows into the cocoon as it passes over the seminal receptacles. As the worm withdraws from the tube and cocoon, the cocoon ends pinch shut, leaving a lemon shaped egg capsule.

HOUSING THE WORM

Now that you have become acquainted with the subject, let's get to its care and feeding.

When temperatures dip near freezing, worms go deeper in the ground to stay below the frost line where they won't be frozen. For a winter supply of worms, then, it is necessary to raise them indoors. The first step is to build a box of wood for housing your guests. Metal should be avoided as acid forming rust will do your worms in. Resins of new redwood are said to be bad also. The size of the bin isn't critical, but the larger it is, the more cumbersome and difficult to move. A smaller box, say two feet square and six inches deep, is light enough to put in a car trunk when you go fishing.

The bottom should have several small holes for drainage. These holes must be covered with a fine copper, *not steel*, screen to prevent worms escaping. A lid of screen, which you may wish to hinge, should cover and seal off the top of the box. The boxes may be supported on bricks so that pans or other containers can be placed beneath in order to collect drainage and prevent them from rotting beneath.

Similar boxes may also be used outside and a series of them can be stacked, one upon another, with blocks between them to provide ventilation, drainage, and access for watering.

A pit dug in the ground to a depth of about four feet and lined with wood or cinder block is also a suitable wormery. A pit four feet square is large enough to hold a lot of worms. A solid top should be provided to keep the pit dark and to keep marauders out. A partially shaded spot which will not collect run-off is desirable.

HOW YOUR WORMS EAT AND SLEEP

Worms thrive on partially decayed organic matter, so some of the more common natural foods are dead grasses, leaves, roots and small animal life. Here is a suggested food and bedding that will appeal to city folk. Cut slabs from corrugated cardboard boxes and place them in the worm bin until they are a few inches from the top. The cardboard should then be soaked and left standing for a few days. Place a layer of peat moss on the top so the cardboard won't lose moisture. All you need now is the worms. They will reproduce in the cardboard corrugations and grow fat on the glue—until the food supply is gone. The cardboard must be kept moist, but not saturated.

A second suggested bedding and food includes a mixture of one part manure, one part black dirt, and one part peat moss. (Don't use manure of chickens or other fowl.) This concoction should be wet and left to stand a few days to prevent heating. A little corn meal or chicken mash can be sprinkled on the top for food. Too much meal or mash will sour, so use it sparingly at first. Experimentation will lead to using the right amount.

Since worms eat just about any decaying organic materials, worm pits may become backyard garbage disposal units. Start the bedding with a mixture of dead grass and leaves, good black dirt and manure. Cover this with a layer of dirt and moisten it. Let the moist concoction set for several days before introducing the worms. Just about any vegetable waste from the kitchen, and some animal leftovers make food for the hungry little fish baits. Add a little dirt each time you add food and remove castings for flower pots or gardens. Cover the top with burlap sacks or corrugated cardboard and keep the pit moist but not drenched. The burlap or boxes provide beds for depositing egg capsules.

REARING MAGGOTS

This one makes the housewife squirm. We (the Department of Fish and Game) often get inquiries about how to raise maggots. Maggots are a bait favored by many.

Rearing maggots during the summer is easy. Simply take an uncooked bone with some flesh on it and put it in a shady spot where flies can get to it. After flies have deposited eggs on the bone, bury it in a moist, sandy spot leaving an inch or two of bone exposed. Eggs will develop on the bone in the sand and maggots can be dug from the sand as they are needed. The exposed portion will insure a continuous supply of eggs.

A piece of sturdy screen or hardware cloth large enough for a fly to enter should be staked over the bone to foil inquisitive cats and dogs.

Maggots may be kept for long periods under refrigeration, but above freezing.

Good fishing and good luck. We hope this helps in your plans for a summer of fishing enjoyment.

By Bab Needham

IF YOU THINK electrofishing is a dynamic new art guaranteed to spirit even the most stubborn trout away from its hideaway and onto your hook—you're wrong. It's an invaluable technique for gathering information about fish abundance in Montana's lakes and streams. And fisheries biologists for the Department of Fish and Game need accurate information to develop management programs for one of Montana's most valuable resources.

Gill nets, traps and seines suffice for sampling fish populations in lakes and reservoirs. However, these devices don't work very well in swift trout streams. Electrical shockers utilizing direct current (DC) are more effective.

Basic equipment for electrofishing includes a portable electric generator and a negative and positive electrode. The negative electrode is usually made of braided copper or steel cable—even a tire chain will often do. The negative electrode is placed in the water at the stream's edge. The positive electrode is carried by one man who wades the stream while probing areas which trout seek for cover (good pools and brushy, undercut banks). Samples can be taken 150 to 200 feet in either direction.

In DC current, the flow of electrons is continuous in the same direction. Fish are attracted by this flow to the positive electrode where they can be collected with a dip net. In small streams, 80 to 90 per cent of the fish population can often be captured. Collected fish are returned to the water unharmed.

Chemical substances in the water determine conductivity which, in turn, influences success of electrofishing. In water with optimum conductivity, fish are attracted to the positive electrode from several feet away and will actually swim upstream.

A DC current of 250-300 volts, producing 1-4 amperes, is adequate for sampling in most Montana waters. Fisheries workers prefer low amperage because it doesn't harm the fish, reduces danger to the operator and doesn't stun or immobilize the fish. More powerful generators produce excessive stunning which reduces ability of the fish to swim to the positive electrode. So, too much "juice" decreases sampling efficiency.

Alternating current (AC) is also suitable for collecting fish under some conditions. However, with AC current, fish are simply stunned and do not orient to either electrode. This results in poor sampling efficiency in swift or turbid streams.

(A wide variety of portable electrical gear will collect fish with no more danger to experienced operators than other types of biological field work. Electrofishing isn't extremely dangerous because fresh water is a fairly poor conductor and portable generators have a relatively small output of electricity.

People are killed by radios falling into bathtubs because the full wattage of a commercial power company is released in a few inches of water. The bathtub drain completes the circuit. That situation and the small wattage of a portable unit traveling through the full flow of a stream are not comparable. [However, don't try electrofishing on your own. Not only is it illegal, but certain safety precautions must be exercised.]

Montana's only fatality from electrofishing happened during unauthorized use of a generator by someone totally unfamiliar with standard safety precautions. In 25 years of electrofishing by the department, no fatalitites or injuries have occurred. The operation is safe when proper precautions are taken.)

The sampling procedure on large rivers nearly equals that on smaller streams. However, a boat carries the generator and electrode system, and sampling involves both floating and wading. Electrical power and electrode design vary on boat-rigged shocking units to overcome sampling limitations in large rivers. Night shocking by boats equipped with underwater lights sometimes in-

creases sampling efficiency.

Portable "back-pack" shockers are used on small streams when limited access makes heavier equipment impractical or impossible. These "back-pack" units are powered either by batteries or small gasoline engines and weigh approximately 40 pounds.

To set fishing seasons and establish creel limits, daily information on fish populations is necessary. However, of greater importance, electrofishing yields accurate fish population data which identifies problems or factors limiting or degrading fish habitat. Undoubtedly, identifying limiting factors is the most important application of electrofishing, since the habitat ultimately determines how many and what kind of fish a stream can produce.

Data obtained by electrofishing assists in developing programs to combat and abate practices which degrade stream quality and fish habitat. An example occurred in 1962 when 13 Montana trout streams were sampled to measure the fish population reductions associated with channel alteration and disturbance. Over 5½ times as many catchable trout and nearly 10 times as many whitefish were present in natural channels as in the altered channels. This data greatly aided enactment of Montana's stream preservation law in 1963.

Stream pollution affects fish numbers. Evaluation of information gathered with electrofishing results in better control of stream pollution. Likewise, practices which alter the watershed—such as logging and grazing—can be evaluated so recommendations can be made to lessen impact on water quality.

Stream dewatering by irrigation and flow regimes below reservoirs directly affect fish abundance. For instance, fish population sampling in the Madison River revealed that substantial increases in trout production could be achieved by increasing the early spring flow from Hebgen Reservoir to create maximum habitat.

Intensive sampling recently revealed that stocking seven- to nine-inch catchable trout in streams with good, wild trout populations actually reduces the number of wild trout present. This discovery eliminates the need for stocking some streams and results in availability of more fish for streams and reservoirs dependent on stocking to supplement or maintain sport fishing.

Stream sampling demonstrations or "show-me" trips are conducted throughout the state each year. If you're interested in preservation of stream habitat and stream fishing—and enjoy a day outdoors—plan to attend one of these for an educational and rewarding experience.

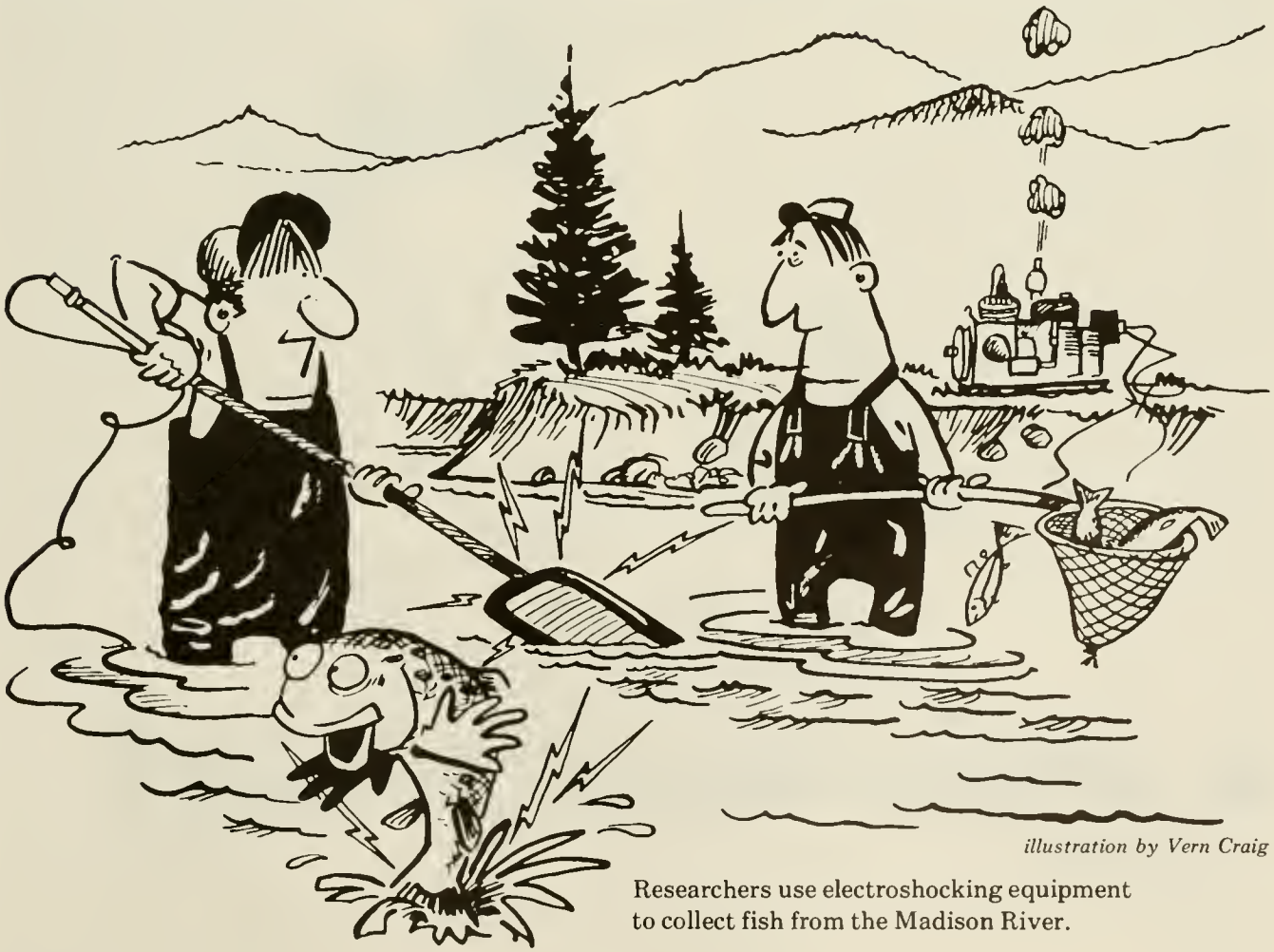


illustration by Vern Craig

Researchers use electroshocking equipment to collect fish from the Madison River.

a state water plant?

By Loren Bahls
illustration by Vern Craig

I'M GRADUALLY LOSING my patience with certain popular articles in a certain popular Department of Fish and Game publication extolling the virtues of quality trout habitat while missing the boat completely on the real bread and butter to husky, scrappy fish.

The midstream boulder, the overhanging tree and the undercut bank might give that lunker all the security it needs. The immaculate riffle—washed clean of every transient particle—provides the pregnant lady fish with an ideal nest for her eggs and nursery for hatching youngsters. Water so pure you could make beer from it may inspire a rainbow to do great things at the business end of a Royal Coachman. And riffles skittering with six-legged creatures are pantry and provender for resident tackle busters.

These are important factors in a quality environment for trout, but we're overlooking that basic component of the ecosystem—the gunk covering the rocks of the streambed—namely algae.

ALGAE—AQUATIC "GRASS"

All critters, no matter how large and ferocious, ultimately depend on something green for their existence. That's a fundamental ecological principle. To illustrate, examine a typical aquatic food chain—algae→ mayfly→ trout—where algae (the aquatic counterpart to grass) is the basic green stuff on which other living things at "higher" levels depend. A square *inch* of stream bottom may contain millions of algae and a square foot of bottom area may harbor one or two dozen mayflies. Trout are much rarer, particularly to a fisherman of my caliber. This is one reason why I chose to become a phycologist (one who studies algae) rather than an ichthyologist (one who catches fish by utilizing his advanced scientific know-how).

Studying algae is not without its problems, however. Many are smaller than a fleck of dust drifting in a sunbeam and a microscope is usually required for identification. Most algae are between 5 and 50 microns long. By comparison, a human hair is about 65 microns *wide*. (To approximate a micron, take a yardstick and divide it into one million equal lengths.) I strongly suspect it is more than coincidental that most algae freaks wear eyeglasses with lenses like the bottoms of Coke bottles and buy their eyedrops by the carload.

ALGAE'S THREE NEEDS

Algae, like grass and other green plants containing chlorophyll, are capable of photosynthesis. Basic requirements for photosynthesis are the same for both terrestrial and aquatic plants—water, nutrients and sunlight—and the end products are universally similar and useful, oxygen and carbohydrates.

Water, often in short supply on land, is usually taken for granted in aquatic systems. It is by no means a "lead pipe cinch." Stream dewatering, from diversion for irrigation or other purposes, can endanger both algae and fish.

Nutrients, such as phosphorous, nitrogen and carbon, may be in short supply or limiting (Flathead Lake) or in overabundance (Ashley Creek below the Kalispell sewage outfall).

Penetration of sunlight presents a problem only in very deep or murky waters where silt or blooms of other algae result in shading. Rivers and streams carrying large amounts of sediment and suspended material are usually poor producers of algae—and fish.

MONTANA'S ALGAE

Basically, Montana has three types of algae: pea soup, moss or weeds and slime.

Late summer boaters on Canyon Ferry Reservoir and Bighorn Lake (Yellowtail Reservoir) can easily spot the pea soup variety. The culprit is usually a single species of blue-green alga and the result appears remarkably similar in texture to the contents of cans labeled "green pea" on local supermarket shelves.

Moss or weeds characterize shallow productive waters where sunlight penetrates to the bottom freely. In some cases (Georgetown Lake and the Madison River) moss and weeds really are aquatic mosses and flowering plants accustomed to growing in water. In other situations, moss and weeds are forms of green alga, sometimes growing in strands over three feet long. That's the case in the cold, clear waters of the Bighorn River below Yellowtail Dam and the East Gallatin River several miles below the Bozeman sewage outfall. (Both rivers are known for their lunker trout.)

My favorite kind of algae happens to be slime algae, the kind that covers the rocks of riffles in many streams and rivers of western Montana. The proper scientific term for this community of algae is

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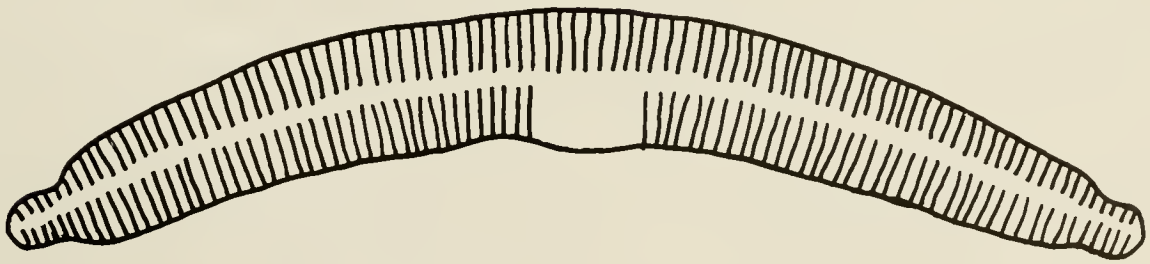

HANNAEA ARCUS

periphyton. If you really want to impress your fishing partner, the equivalent German word is *Aufwuchs* (pronounced "owf-wooks"), but unless you're prepared to look for a new sidekick, you better stick with periphyton or even slime.

SLIPPERY SLIME—DIATOMS

The periphyton community is composed mostly of diatoms. Diatoms are brownish, one-celled plants enclosed in ornately marked silica shells. An average diatom is about 25 microns long. It would take about 1,000 laid end to end to make an inch. Although most fishermen (or even fish) have never seen a diatom, they are extremely important. Stonefly nymphs will graze diatoms just as herefords will graze bluebunch wheatgrass. This conversion of plant to animal matter is a key link in the food chain of all Montana trout streams.

What diatoms lack in size, they make up for in array of shapes. Some are shaped like bottles, others like miniature boats and still others resemble the hub and spokes of a wagon wheel minus the rim. One kind looks like a banana and another bears striking resemblance to a steel-belted radial tire, sloppy sidewalls and all.

Most anglers are familiar with one feature of the periphyton community—it's slipperier than a Watergate witness. And there's a sound biological reason for this: Diatoms are coated with a gelatinous mucilage enabling them to glide over rocks with ease. When you compact millions of these slimy little creatures under the boot of a pair of chest waders, some dynamic things can happen.

A few years ago, I was out fishing the West Gallatin with my brother-in-law. It was early fall and the diatoms were thick and treacherous on the rocks. An unseasonal storm raised the water level several inches and most crossings were attempted only with a prayer, a wading staff and a life insurance policy. We weren't having much luck, so my partner checked his solunar table, measured water temperature and barometric pressure, consulted McClane and decided we must cross the river to improve our chances. The crossing he chose looked easy enough, except that the fish were grabbing onto rocks with their fins to avoid being washed downstream.

Being the braver, my brother-in-law volunteered to cross first. He was doing fine until, about three steps from the near bank, he slipped and was quickly carried away in the general direction of Three Forks at the approximate speed of a bat leaving the proverbial underworld. Above the torrential roar of the river I could discern some of the saltiest language ever heard in those parts. As the blue streak of expletives subsided, it was quite clear he blamed his present misfortune on the slime coating the rocks on the river bottom.

As I ran along the bank shouting encouragement, I tried to impress upon him that the cause of his predicament was technically not just slime but the periphyton community, composed of countless gelatin-covered, silica-walled, single-celled plants called diatoms. He wasn't impressed. As I fished the poor devil out of the river some distance downstream, he mumbled something about certain people having too much education. This was obviously an insensible statement which I attributed to the delirium caused by inhaling too much water.

SECOND-CLASS CITIZENS

Algae have been relegated to the status of second-class citizens in the plant kingdom. Their fine detail is lost to the unaided eye, their gross appearance is revolting to many and their presence is often considered a nuisance. They are about as appealing to a fisherman as a leaky hip boot. Even so, algae are extremely important in the ecology of Montana waters.

Montana has a state tree (ponderosa pine), a state flower (bitterroot), and, thanks to the 1973 legislature, a state grass (bluebunch wheatgrass). All three are terrestrial. Why then, with thousands of miles of rivers and streams and many hundreds of lakes and reservoirs, nationally famous trout fishing and widely acclaimed water-based recreational opportunities, do we not have a state water plant? The answer is simple—because nobody but me ever thought of it before.

BANANA-SHAPED CANDIDATE

Before *Montana Outdoors* is flooded with nominations, I would like to present my candidate—*Hannaea arcus*. *Hannaea* is the aforementioned banana-shaped diatom, synonymous with cold, clear waters at higher elevations and coexistent with cutthroat and grayling. It is probably found in all of the better quality rivers and streams in western Montana, but never in sufficient numbers to cause blooms or taste and odor problems. As an indicator of water quality, there are few better; when the westslope cutthroat trout is gone, *Hannaea* may well be gone too.

Someday it will deservedly take its place along with the ponderosa and the bitterroot on the inside cover of the state highway map as Montana's diatom. It is an appropriate representative of the grass of Montana's waters.

Next Time

Watch for these features in the July/August 1974 *Montana Outdoors*.

- —the yellowstone river
- —montana wilderness
- —absaroka-beartooth wilderness proposal
- —ATV use—and abuse
- —the waters of the flathead
- —what makes a stream good fishing?

editorial

message to devoto

By A.B. Guthrie, Jr.

Bernard DeVoto (1897-1955) was a writer of U.S. history, fiction and criticism. He served as editor of *The Saturday Review of Literature* and for more than 20 years wrote "The Easy Chair" for *Harper's*. To most of his readers, he was identified with the Rocky Mountain West. His book, "Across the Wide Missouri," won a Pulitzer Prize. His "Journals" of Lewis and Clark ranks among the most widely read chronicles of their wilderness adventures.—*Ed.*

Montana, the western state you loved most, and a large part of the West that once you defended are being eaten alive, skin torn from fossil flesh and the flesh devoured and digested and residual flesh and skin left as eternal waste.

The coal and power monsters, assisted by the Department of Interior, the Bureau of Land Management and the Bureau of Indian Affairs with the railroads cooperating, are not only skinning the high plains of Montana but also skinning or about to skin great areas of Wyoming and the Dakotas, leveling mountain and butte with their giant machines, leaving spoil banks they say they'll restore, as if restoration were a matter of a few years and not generations, if ever.

All this for coal, Benny. All this as one answer to the shortage of energy. All this to fire installations that will poison the air, possibly or probably poison crops and livestock and wildlife and poison people God knows how many miles away. All this for the bucks.

And the water. The Yellowstone that you and I, harking back to old days, used to call the Roche Jaune. Applications now on file would take one-third of its volume. More will be filed. More and more. And the river of legend, the river that winds through valley and rimrock, that ribbons the dry land with green and irrigates crops—that stream will run dry if greed is given its head. Out of old sentiment we could still call it the Yellowstone but not the Yellowstone River.

Reservoirs, these greedygut people say. We will build reservoirs and capture the waste water of winter and use it as needed. Yes, reservoirs on the Yellowstone and every usable tributary.

You remember, Benny, we used to speak about reservoirs. How they silted up. How much land they put out of production and, drawn down, left ugly. How greatly costs overrode foreseeable profits. One of the same crew that argued for dams, the Bureau of Reclamation, has given options for water to energy outfits, options for a great deal of water to prospective dam builders.

continued

We stood at Kansas City once, guests of the Bureau and the Corps of Engineers, and looked at the concreted Kaw and the piled Missouri and the reclaimed land bright with glass factories and were told that never again would Kansas City have a major flood. And the very next year, almost to a day, it suffered the greatest flood in its history. Remember?

I can see you, a rather small man with thick glasses, standing up to the stately Gen. Pick, who defended the upper Missouri River plan on the grounds of national defense and you asked him if dams weren't easy bomb targets and how many transcontinental trains could be built for the money. Whereupon Gen. Pick became mystic.

These last paragraphs are somewhat beside the point, as you would be the first to tell me, but the fact of the rape of the high plains is right in your field. Beside it the greed and grasp of stockmen you fought to a standstill are peanuts.

If it's Indians you're interested in, as you would be, then I must tell you that the Cheyennes and Crows are being royally screwed. Acres and acres of their reservations—56 per cent in the case of the Cheyennes and nearly 300,000 acres in the case of the Crows—have been leased, as elsewhere, through weasel tactics, deceit, fraud and threat and certainly in part through bad advice from the Indian Bureau. Put the matter of money aside, though by contract it wasn't and never will be enough. As circumstances stand, if suits and protests do not avail, the Indians will lose their reservations and with them their way of life. Sure, the projects will give many men work, but most of the men will be white and most of the side allurements offered Indians will be used and enjoyed and appropriated by whites.

It is predicted and credible that men will come in vast numbers to this scene of the coal Comstock Lode, managers among them and technicians and statisticians and men skilled in the operation of heavy machinery, along with other white- and blue-collar workers and business troops to see to their wants and their pleasures. Can you imagine, as has been envisaged, a city of 200,000 pitched on the lone prairie? How in hell manage, how get along, how in this Montana of resources otherwise limited, of open semiarid space and few souls to the square mile?

There are people in our West, lawyers and speculators and lease hounds and such, who back this devil's development, as I don't need to tell you. There are towns, some towns, that support it, hearing the voice of the cash register over the silent roar of eventual ruin.

But a lot of us in the West, particularly in Montana by the evidence, are not unaware any more. You have helped us to know, to realize, to foresee. I doubt you would write a piece again and title it "The West Against Itself." By God, sir, it is the East and eastern money that bid fair to increase and perpetuate our colonial status. It is the East that would destroy us.

What we lack, we in the West who resist rape, is a voice. We raise ours, as has Alvin M. Josephy, Jr., an outlander, to whose article in *Audubon* I am indebted for data. We holler and shout, but none of us has a voice of thunder, a voice charged with eloquence and outrage and courage and fact. Your voice, Benny.

We need you.

wildlife shorts

Screech owls don't screech.

Deer are the most abundant and hunted big game animal, both in Montana and in the United States.

The cheetah can cover 100 yards in 4-½ seconds.

Contrary to many common beliefs and recent news stories, the grizzly bear is not endangered in Montana.

One of the best ways to help wildlife is to buy hunting and fishing licenses. Another is to join an organization, like Ducks Unlimited, which devotes efforts to acquisition and maintenance of important waterfowl habitat.

Opossums have 50 teeth—more than any American wild mammal.

The cutthroat and the rainbow trout—when placed in the same waters—will often interbreed and form hybrids displaying some characteristics of each species.

Celebrate National Hunting and Fishing Day Sept. 28, 1974.

Montana State Fishing Records

Since we published the first roundup of our rather incomplete state fishing records, there has been some interest from those wishing to make the record book. But still, several records remain unfilled. For example, the department has no official record for black crappie, white crappie, pallid sturgeon, black bullhead, goldeye or lake whitefish.

Catch a good-sized specimen of one of these species, contact the department and chances are your name will be added to the official book of state fishing records.

To enter your whopper, simply follow these ground rules:

• The fish must be weighed by a government-tested scale such as those found in grocery stores and meat markets.

• If possible, the fish must be weighed in the presence of a Department of Fish and Game employe. An affidavit (stating length and weight) from the store at which the fish was weighed will be accepted.

• The fish must be correctly indentified, so in confusing situations, a department fisheries biologist should be called in to make sure the trophy is correctly identified. A picture clearly showing all characteristics will suffice.

• Information—length, weight, how caught, date caught, name of water, nearest town and name and age of fisherman—should be sent to the Environment and Information Division, Department of Fish and Game; Helena, Mont. 59601.

Good luck.

The record for fresh-water drum was broken five times in the summer of 1973. One of the challengers was Tony Dyba, Glasgow, with an 11 pound, 11 ounce fish. His record was broken later in the summer by George Gallagher. F&G photo by Mike Aderhold

Species	Weight (lbs.-oz.)	Angler	Year	Location
Brook trout	9 lbs. 1 oz.	John R. Cook	1940	Lower Two Medicine Lake
Brown trout	29 lbs.	E.H. "Peck" Bacon	1966	Wade Lake
Black crappie	No record			
Black bullhead	No record			
Bluegill	2 lbs. 8 oz.	George Schlosser	1967	Dengel Reservoir
Burbot (ling)	11 lbs. 12 oz.	Jim Cooper	1967	Fort Peck Reservoir
Coho	4 lbs. 14 oz.	Irven Stohl	1973	Fort Peck Reservoir
Cutthroat trout	16 lbs.	William D. Sands	1955	Red Eagle Lake
Channel catfish	21 lbs. 5 oz.	Gary Eppers	1964	Missouri River
Dolly Varden	12 lbs. 12 oz.	Dale Hoth	1974	Flathead Lake
Drum	13 lbs. 6 oz.	George Gallagher	1973	Fort Peck Reservoir
Golden trout	1 lb. 6-¼ oz.	Glenn Klofstad	1973	Island Lake
Goldeye	No record			
Grayling	1 lb. 12 oz.	Anne Gustafson	1973	Graves Creek
King salmon (chinook)	4 lbs. 7 oz.	Berry Gillis	1973	Missouri River
Kokanee salmon	5 lbs. 4 oz.	Unknown		
Lake trout	27 lbs. 12 oz.	Walter Bahr	1973	Flathead Lake
Lake whitefish	No record			
Largemouth bass	7 lbs. 6 oz.	Jere Hightower	1973	Ninepipe Reservoir
Mountain whitefish	4 lbs. 2½ oz.	Bob Johnson	1973	Clark Fork River
Northern pike	37 lbs. 8 oz.	Lance Moyer	1972	Tongue River Reservoir
Paddlefish	142 lbs. 8 oz.	Larry Branstetter	1973	Missouri River
Pallid sturgeon	No record			
Perch (yellow)	2 lbs.	Gerald Pottratz	1974	Nelson Reservoir
Rainbow trout	20 lbs.	C.J. Brohaugh	1952	Cliff Lake
Rainbow-cutthroat hybrid	17 lbs. 10 oz.	R.A. Rousselle	1973	Ashley Lake
Sauger	4 lbs. 10 oz.	Ted Peterson	1972	Fort Peck Reservoir
Smallmouth bass	4 lbs. 4 oz.	Mrs. Bert Campbell	1971	
Sturgeon (shovelnose)	6 lbs.	Allen Schrimsher	1973	Fort Peck Reservoir
Sturgeon (white)	96 lbs.	Herb Stout	1968	Kootenai River
Walleye	13 lbs.	Robert Mills	1972	Nelson Reservoir
White crappie	No record			